

HYDROLOGIA PHILOSOPHICA
O R,
An ACCOUNT of
ILMINGTON
WATERS
In *Warwick-shire*;
With Directions for the Drink-
ing of the same.

Together with some Experimental Observations
touching the Original of Compound Bodies.

By SAM. DERHAM Bachelour in
Physick lately of *Magd. Hall. OXON.*

OXFORD,

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TO HIS
Honoured Friend
WILLIAM LENTHALL Esq;
of *Haseley*.

I was not my Ambitious Design
but the importunity, or rather
Command, of several Gentlemen
to commit to the Press these Experi-
ments I had made on *Ilmington Waters*,
that maketh me thus appear; however
was resolved it should pass as from an
unknown Pen, until I found Conceal-
ment was impossible; and by absconding
should seem to impose falsities on the
World; which are the only Reasons of
my Name in Print. And seeing that
hereby I do expose my self to the Cen-
sure of all men, although it is but a mean
Return for your Kindness and Civilities
to me to entrench farther upon your
good Nature; yet I hope you'll allow
this following Treatise a propitious Ac-
ceptance, whose Prudence and Learning
is able to withdraw me from the Calum-
ny of mine Enemies. Although the

The Epistle &c.

greatest Patron that ever liv'd was never able to protect Books from Censure, (neither is it reasonable to impose Opinions in Philosophy as Truths necessarily to be believed against the Arguments of more solid judgement) yet a just Umpire may advance Truth against the malicious Cavils of them, that neither consider the Sureness of the Experiments, nor whether the Deductions be a forced Consequence or the Sense of Authors perverted, but through Envy quarrel at the Treatise because Delivered by such an Author. Flattery for Patronage I shall avoid, true praise being not more pleasing to You, than Counterfeit is ungrateful, but shall presume the more because of your imbred proneness to the Advancement of Scholastick Undertakings. Neither shall I endeavour an Encomium of Him, whose Merits and Excellent Endowments have already become their own Heralds, beyond the Praise of

*Your truly Affectionate
and Humble Servant*

SAMUEL DERHAM.

THE P R E F A C E.

READER,

PErhaps it may seem strange that I should thus undertake an Hydrological Essay, seeing that many Eminent Writers have given their judgement of the Cause and Vertues of Mineral Waters, such as Georgius Agricola, Libavius, Solinander, Andr. Baccius, Fallopius; and of our own Countrymen Dr. Jorden, Simpson, Turner and many others both Ancient and Modern Authors. Yet there were several Reasons inducing me to publish this my Scrutiny into the Nature and Operation of this New-found Spring, by some called Balmore Waters naming the Spring from the Place, which is near Ilmington a Town in Warwick-shire. This may also deserve the Name of Ilmington-Spaw from its brackishness, according to Van Helmonts's

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Appellation Parad. 3 and 4 of Fontes aciduli, Spadana or Spaw-Waters. Which name I shall retain in my following Treatise.

My chief Inducements hereto, were

First, The Common Good ; seeing Multitudes dayly flocked to this Fountain, of whom many were poor illiterate Countrymen, that inconsiderately (without preparing their Bodies or Physitians advise) repairing hitherto might as well have hastened to their ruine, as to recover their impaired Health. For,

The most ingenious Dr. Cole who first tryed and applauded these Waters by his recommending a Person of Quality to the Drinking of them, did so alarum the Ordinary sort of People and the rude Mobile, as if Waters had been found with some Supernatural Vertue like the Pool of Bethesda, or the Waters of Jordan when they cured Leprous Naaman the Syrian.

Secondly, The Doctor being called away by his Employment, I was desired by several Gentlemen to commit the Tryals I had made on those Waters to the Press; on no other design then to give Caution to the incantelous Multitude, among which many are (as
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an * Author observed) like so many Animals that follow one another and are apt to go the broader way, though it lead to ruine.

* Auth. of the Query about Drinking the Bath-water prefixed to Dr. Jonston on the Bath.

Thirdly, Ancient Authors did usually take a general Survey of Mineral Waters, not descending to a strict Scrutiny by Experiments into Particular Springs. Upon which account many things have been left false and imperfect, which an Examination of Particulars may descry; and perhaps afford more of knowledge to Posterity though in a few Experiments, than in great Volumes of Conjectural Philosophy. As Dr. Tyson in his Phocæna Page 9. rightly saith, 'Malpighius in his Silk-worm hath done more then Jonston in his whole Book of Insects; and He and the ingenious Dr. Crew have taught us more of Plants, than either Gerard or Parkinson.

Yet I desire not to contemn, but to speak with due honour and reverence of the writings of the Ancients to whom we owe great part of our knowledge, but withal hoping that I may have as much freedome to communicate my Sentiments, as others have done theirs before me.

As

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As for the Calumny and Reproach which I shall occur from mine Enemies, and especially those that out of a Disgust to the Author verify the Proverb Try the Man and not the Cause, I shall pass by remembering the Saying

-----Habent sua fata libelli

But least that by making use of some words mentioned by Helmont and other Chymists, such as Archeus, Lessas terræ, Acid and Alkali &c. I should seem far short of answering my Design, I shall by the way hint out the Sence of them, least that by obscure Terms I should seem to darken the Matter and amuse the Reader, that is unacquainted with Chymistry.

*Helmont De Form. Ortu Sect. 61. thus explaineth himself Repetam femininum massam recipere in se corporalem Auram, vulcanum, Quem Archeum nomeno. Now the Aura Vitalis by him termed Archeus, is but that Stamp or Divine Impress made at first by God Almighty, to direct blind Matter in the Composition of an Object. For we cannot suppose that an Embryo is formed by a fortuitous concurrence of Atoms, and that Animals do propagate
after*

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*after their kind by an accidental Conjuncti-
on of Matter; but the Divine Fiat in the
Creation made an over-ruling Power to the
work of Generation and Specification of the
Individual: whether it be called Archeus,
vis $\pi\alpha\lambda\lambda\alpha$, Forma &c. Which was at
first made by God the Creator, and as Hel-
mont else-where telleth us is as a Faber or
Workman to the shaping of a Concrete in
its Generation.*

*Leffas terræ is that Succus terræ fra-
cidus unde surgit omne plantarum ge-
nus visibili carens semine, sataque se-
mina promoventur in Destinationes.
Helm. Imag. Ferm. Parag. 31. viz, That
fracid juice of the Earth, that is the Nu-
tritive Juice to Vegetables. For Water
on the Earth exposed to heat and air will be
soon endowed with a putrid Ferment, which
is a Leffas convertible by the Archeus into
Vegetables.*

*Salts are either Acid or Alkalizate,
upon the mixture of which contrary Salts
an Effervescence will follow. So that an
Alkali may be thus described. It is a fixed
Salt which will make an Ebullition with an
Acid, and by taking off the Edges of its*

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Par-

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Particles will sweeten an Acid Liquor.

As for Mineral Waters, Libavius giveth us this Notion Quæ a simplici vulgari & mera discedentes, cum aliquo subterraneorum conspirant, & aut spiritaliter sunt tinctæ aut mistæ corporaliter. Judicio Aquar. Lib. i. Cap. i. viz. Waters that besides their own Nature, have imbibed something of the quality or substance of some Subterranean Mine. What are the Subterranea he afterwards telleth us Lib. i; but Gab. Fallopius De Therm. Aq. Cap. 8. ranketh them under Five Heads. viz. Vapours, Juices, Metals, Stones, and Earth.

As for Vapours impregnating Waters in their Current, I see no reason to make them a distinct Ingredient from the others, Fallopius alloweth only Vapours to be found in Waters that are Poisonous, Bituminous, and Sulphureous, yet of what kind soever, they seem not to differ from the Evaporating Object: as the Vapour of Water, is but Water rarified, whose Particles recollected in a Receiver may appear again under the form of Water. As Helmont Parad. 2. hath observed, Vapor reip̃sa nil aliud est
Mate-

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Materialiter & formaliter, quam Atomorum Aquæ in altum sublata Congeries. *To the same effect speaketh Libavius de Jud. Aq. Lib. 1. Cap. 6.*

Dr. Jorden On Natur. Bath. and Min. Wat. Cap. 4. not content with what Fallopius hath done, especially because New Minerals have lately been discovered (as Calacem in the East Indies, Rhufma and Terra Ghetta in Turkey &c.) and perhaps future Ages may discover many more) hath comprehended them under Seven Heads; taking a Mineral for An inanimate Perfect Body bred in a Mine, in the Bowels of the Earth. His Genera are 1 Earth, 2 Stone, 3 Bitumen, 4 Salts or Concrete Juices, 5 Spirits, 6 Mean or half Metals, 7 Metals. Of all which in as much as they cause Alterations in Waters, I shall take a short Survey; Brevity here beeing intended.

First, Earth is a cold dry sluggish Body altogether effete in its vertue, except when it containeth some active Principle; such as a Nitrous Salt by which Fullers-Earth doth scour Cloth, and Marle laid on Land
(b 2) *doth*

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doth cause Fertility; or an Aluminous Salt, such as is found near Scarbrough Spaw &c. Upon which account the Chymists rightly call Simple Earth Caput Mortuum or Terra damnata. Water hereby may become turbid and muddy, but not impregnate with any Vertue.

*Secondly, Stones by their Qualities of Cold, Dryness, and Stipticity come near that of Earth. Tea as Dr. Jorden Cap. 4. hath hinted to us, Stones in their simple Nature distinct from any other Ingredient, are but as a Caput Mortuum and untamable by Fire or Water. 'Tis true some Stones will melt; others by Calcination turn as it were to Asbes; but that is from a Heterogeneous Mixture of some Salt, Metal, &c. And this may be concluded hence, The more pure and free from Mixture Stones are, by so much the more indissoluble by Water or the devouring flames of Fire; as Diamonds, Amiantus or Alumen plumosum, Glymmer, Saxum Arenarium &c; all which stony Concretions will endure the Fire: yea I suppose had we but a pure stony Body it would endure the washings of Water, and
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the utmost degree of Fire. Pliny Natur. Hist. Lib. 36. Cap. 19. saith Amiantus lapis nihil igni deperdit. Not only the Terra Damnata left after the Active Principles are drawn off in Distillation will endure the Fire; but the Asbestum which is an Efflorescence of the Amiantus, and many such like Stony Concretions (I doubt not) were they free from Heterogeneous Mixtures.

Stones then in their simple Nature yield no Vertue to Springs, except whilst in their Primitive juices or Solutis principiis; for then they may cause an Alteration, as we may perceive by many cold petrifying Springs; of which almost infinite Examples might be produced here in our own Country. But when there is a mixture with a Minera, then Stones by Fire or Water may soon suffer a Dissolution: as Marcasites of Iron, Copper, Alum, &c. not only by fire may undergo a Change, but also may communicate their Vertue to Waters having a proper Menstruum.

Thirdly, Bitumina are either hard as
Am-

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Amber, Carbofossilis ; or Liquid as Petroleum and Naphtha. We find by dayly Experience that unctuous Matter or Oyls will not undergo a perfect mixture with Water : yet by some Mineral juice may have its body so opened as to come floating with the Spring Water though in a confused Posture. Tea saith Fallopius de Aq. Therm. Cap. 8. It is sometimes so confused, that a Separation from the Water is very difficult. Instances of Bituminous Waters he giveth us ; as the River Liparis in Cilicia, which by its plenty will as it were anoint the Bodies of them that swim in it ; the Fountains of Mount Gibbus near Modena in Italy ; many Fountains likewise near Baia in Campania ; so also Springs at the foot of Vesuvius ; many also we read of in Saxony, Swedland, and at Avergne in France ; and of one famous in our own Country at Pitchford in Shropshire ; and that Bitumen is the predominant Principle in our Springs at Bath, Dr. Jorden hath proved De Nat. Bath & Min. Wat. Cap. 6:

Fourthly, Concrete Juices called Salts
which

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which are not only found in Waters but being dissolved make the Current Springs as so many Menstruums to unlock the Bodies of other Minerals. The Species are usually reckoned Four viz. Alum, Vitriol, Nitre and Common Salt (but as for the Number I shall not here dispute) 'Tis true different Salts will shoot by Chrystallization into several Forms, as Vitriol and Alum into Glebas (although these of Alum differ something from them of Vitriol) Nitre into Stirias and Salt into Tesseras; so likewise will other Species of Salt comprehended under these, by reason of their Glebes and difference of Particles. As for the Vertues of such Springs we must look to the Nature of the Ingredients; and whether the Waters are not impregnated with several Mineras; from whence there must needs follow great Variety in Mineral Waters. That Salt, Nitre, Alum, and Vitriol are Ingredients of Mineral Waters, we have the Testimony of several Authors, too many here to relate. As Salt-Springs at Saltzburgh and Halstat, and many other places in Germany; the Salt-Springs in Tuscany, and as our Springs at Droit-Wich and

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at Nant-Wich will testify. Nitrous Springs we read of at Calestria in Macedonia; in many places of Egypt; in many places in France mentioned by Du Clos Classe Second and Third; and Nitrous Springs by Baccius De Therm. Lib. 5. Cap. 6. Alum Springs are frequent in Tuscany and many other Places of Italy; and also in Germany, and in Spain; with us at Okenyate in Shrop-shire, and that famous Spaw at Scarbrough in York-shire. Vitrioline Waters are also found (although the truth thereof is questioned by Dr. Lister De Font. Med. Angl. Cap. 7.) Instances of which Dr. Jorden de Nat. Ba. Cap. 7. giveth us; as that at Cyprus described by Galen where the Water is Green, at Smolnicium in Hungary, in Transilvania &c, in which (saith he) the very Body of Vitriol is found. Besides the Testimony of Helmont Paradox. 4. of Pauhont and Savenir two German Spaws, and the Experiments of Dr. Simpson on our Scarbrough Spaw; and as I shall prove of Ulmington Spaw. As for the distinction of being virtually or by its quality contained I cannot allow of, not finding any solid Reason
how

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how an Accident can be separated from his Substance, and remain Existent in another : for I look upon that Rule as true Accidens non migrat a Subiecto in Subiectum.

Fifthly, Spirits (so called from their Volatility by fire) that enter the Composition of Metals will not endure fusion by fire but easily fly off ; such as Quicksilver, Auripigmentum, Sandaraca, Chrysocola, Cadmia &c ; which by some Authors are reckoned for Concrete Juices, but by others for Spirits from their Volatility : and Waters endowed with these kind of Ingredients are generally poisonous. Agricola Lib. 1. & 2. telleth us of waters betwixt Seburgh and Strapela that by their Malignancy will kill Fishes, and other Animals that drink thereof. Arsenical Waters we read of, as at Circum in Thracia, at Perant near Mompelier ; of many such waters Fallopius de Therm. Aq. giveth us an account. Now Dr. Jorden reckoneth some Waters that contain Quicksilver for wholesome waters, as that at Serra Morena and La Nava in Spain, Almagra and Toletum. But if we consider how that Mercury is an

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Enemy to the Nervous Parts, especially when unprepared; how it abounds with Arsenical Particles before it is purified, we may much doubt of the wholesomeness of them, yet I shall not dispute against the Possibility of the Thing. So also are these from Sulphur very dangerous, because they often partake of a Poisonous Minera.

These that partake of Cadmia are to be avoided, because the Natural Cadmia is Poisonous and a strong Caustick. Cadmia fossili Aquæ infectæ acres esse consueverunt, Agric. de Natur. Eor. Efflu. ex Terra. Lib. I.

Sixthly, Mean or half Metals, so called because they are fusible but not malleable like Metals, as Antimony, Bismuthum or Tin-Glass found in England and Germany. These may be Ingredients to Mineral waters, and for the Vertues of such we must look to the impregnating Object.

Seventhly, Metals as Lead, Tin, Iron Gold, Copper, and Silver: for Mercury from its Volatility by fire is reckoned by Dr. Jorden among Mineral Spirits. These saith

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saith Fallopius de Therm. Aq. Cap. 8. May be Ingredients in Mineral waters, but telleth us, that he never knew any Particular Spring in which Metals had their share.

But we have sufficient Testimony of Particular Springs that are impregnated with Metals. Baccius De Therm. Lib. 6. Cap. 3. giveth us an account of several waters that have preyed on Iron, and several whose Vertue is from the Magnet (which indeed is a better sort of Iron-stone) Solinander De Font. Temperat. Cap. 6. Instanceth divers Springs containing Metalline Ingredients, as that impregnated with Copper at Baia in Campania, and that at Luca called St. John's Bath; with Lead, as the Lead-Waters in Lotharingia; with Iron, as at Siena, Verona, and Luca. To which I might add our Chalybeat waters at Tunbridge, Astrap, and Scarbrough, with our late found Spring at Ilmington. The same Author telleth us that waters are found impregnated with Gold, Silver, Lead, and Precious Stones although very rarely, because of their Scarcity, and the compact Substances of Pearls.

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Multitude of Examples of Mineral waters we have cited by Dr. Jorden On Min. Wat. & Nat. Bat. Cap. 10. to whom I may refer the Reader.

But it may be questioned; how can Earth be reckoned as a Mineral and one of the foregoing seven Genera, taking a Mineral for an Inanimate perfect Body bred in the Bowels of the Earth? Answ. Minerals are here taken in a large sense, under which Earth is comprehended in as much as it is the Receptacle and Matrix of Subterraneous Concretes, whose Particles may also be communicated to water in its Current; Stones also in this respect may be taken for Minerals.

*Concrete Juices or Salts are reckoned as a Distinct Genus (although as I shall hereafter prove, that all Compound Bodies in the Animal, Vegetable, and Mineral Kingdome are made out of a Succus as their more immediate Matter) from their Properties resulting from their peculiar texture of Parts. Thus Salts are reckoned from their easy Dissolution in water, and their reconcretion. Bitumina from their burning and wasting by fire, although they enter
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not the Composition of a Metal. Sulphur will burn and wast by fire, and is also often a Metalline Ingredient; and is reckoned with Mercury &c. among Mineral Spirits, which are so called from their Volatility by fire although they enter the Composition of Metals. Antimony and Tin Glafs are accounted as half Metals, because they are fusible, but not malleable like Metals; which are both Fusible and Malleable Mineral Substances.

I need not Apologize for the Usefulness of Mineral Waters, seeing they have been for several Hundreds of years in great Estimation. The Romans we are informed by Baccius De Therm. had their Baths in great request, and for the greater splendor had many Magnificent Buildings erected at Rome. And of the frequent Bathings of the Turks, although only with pure Water Alpinus De Medic. Ægypt. Lib. 3. Cap. 17. giveth us an Account.

I need not likewise relate the Superstition of the Ancients; who, when a Mineral Spring was found, from the strangeness of its Effects soon dedicated it to some Saint or Deity, because they made little Scrutiny
into

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into the Nature of Mineral Waters. And since that Experimental Philosophy hath found favour in the world, knowledge herein hath dayly encreased; and for the Promotion hereof, let us make enquiry into each Particular, that at length we may arrive to Universal Conclusions.

In the Prosecution of my Design I shall observe this method, and accordingly divide the following Treatise.

First, To enquire into the Nature of Compound Bodies either in the Animal, Vegetable or Mineral Kingdom; under Minerals will fall in a Consideration of the Original and Difference of Glebes, that chiefly give Essence to Mineral-Waters.

Secondly, To make Experimental Essays into the Nature of Ilmington-Spring.

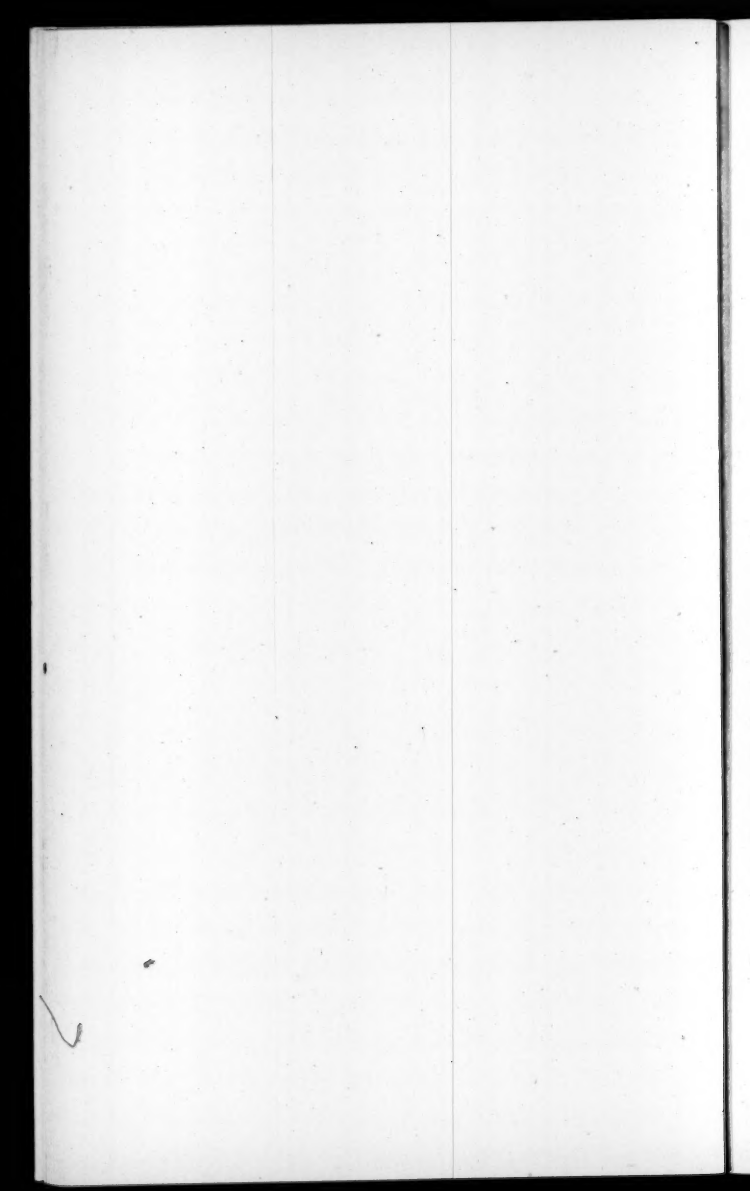
Thirdly, After taking a short Survey of most Diseases incident to the Body of man, as to their Causes or Original; to enquire how far Ilmington-Spaw may
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conduce to their Cure, and to preserve
Health whilst entire.

But by the way take notice, That where-
as I made the Experiments on Ilming-
ton-Spaw in a dry Season, and was very
careful and exact in the weight of the
water which I have given Pag. 48; it
may admit of a Variation not only in
weight, but be weakned in its Vertue in
a wet Season when the Springs are rank
by a mixture of Rain-water; and also
by the breaking in of any fresh Spring.

Hydro-



Hydrologia Philosophica

O R

An Account of

ILMINGTON**W A T E R S, &c.**

HAVING Observed with * *Paracelsus* that proof by Authority, where Reason and Experience are deficient, is altogether uncertain; and that *Philosophy* is not to be founded on *Phanfy*, but on Experience and plain Natural Diductions therefrom: I shall in this following Treatise lay down only such Positions, that I find built on Experience. For if bare Authority might pass for Proof, I might cite *Anaxagoras* to prove the Snow black, and such like

* *Probatio ea nunci & nibili est, quā per alios nimirum Galenum, Avicennam, Rhafin &c. nostra tuemur & velamus Paracel. L. 4. de Orig. Morb. Matricis.*

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strange speculations, which to the judicious will seem only as such. Yet I shall not contemn Authority, but yeild due honour and Reverence to our Ancestors, whose Works still are for our Instruction; but shall chiefly insist in the footsteps of them, that have made Experimental Essayes for their guid.

In the prosecution of my design, I shall speak somewhat as to the Principles of Concretes, which will lead me on to a consideration of Mineral Glebes, that principally give Essence to *Spaw waters*.

Divers have been the opinions of Philosophers about the Elements of Compound bodies; not to mention the Opiniõ of *Heraclitus*, who observing *Fire* to be an active simple tenuious body, made it the first Principle of all things; nor the opinion of *Hesiod*, assigning *Earth* for the Original of Compounds, there are other more famous, which Sects of Philosophers do still maintain. Such as that 1st, of the *Aristotelians*; 2^{ly}, of the *Chymists*; 3^{ly}, of *Thales Milesius*, *Helmont* and others; 4^{ly} of *Epicurus* and *Democritus*.

1. The *Aristotelians* place the foundation of Bodies in the four Elements (*viz*) *Fire*, *Air*, *Water*, and *Earth*. Which I wonder at, seeing *Aristotle lib. 2. de gener. cap. 8.* alloweth of, and urgeth that Argument. *Bodies consist of such Principles into which they are ultimately reducible.* But by all the Analysis that either Art or Nature could make, did never find *Fire* an ingre-

ingredient. To talk of an Element of Fire *sub Concavo Lune*, is but a supposition without a Demonstration. The *Air* we know is necessary, and that in several respects, to the Continuance, and Preservation of our lives, but no Demonstration of its first being an Element. The Quaternary of Elements is so far from solving the Phenomena, of the more abstruse Recesses of Nature; that it is all one as D^r Willis *de Ferm. c. 1. p. 3.* hath rightly observed, to say a House is made of wood and stones, as to say a Body is made of the Four Elements. For it is hard to imagine such Things to be Principles, which neither answer the Phænomena of Nature, nor the Reduction of Concretes, and truly the supposing Such for Elements, will be but an Imaginary Philosophy.

2¹⁷. The Chymical Principles are, Salt, Sulphur, and Mercury, because in an Analysis of Bodies by Fire, these Three appear; whether the Concrete belong to the Animal, Vegetable, or Mineral kingdom. By Reduction of a Metal or Mineral (as the Chymists thought) into its first Elements, they extract a Sulphur or Oyl, a Fluid which in Minerals is a plain Mercury or Quicksilver, and a Salt. Out of Vegetables and Animals, they extract an Oyl or Sulphureous Spirit, which is but an Essential Oyl gotten by Fermentation, a Salt, and Mercury; which last is but the Phlegm or Water, whose Particles are driven off by the

stress of Fire, and recollected in a Receiver.

But the ingenious D^r Willis de Fermen. c. 2. observing a *faces* left after Distillation, and when the other Principles are drawn off to be quite useless, yea void of Mutation and Exaltation, and therefore properly called *Caput Mortuum*, or *Terra Damnata*. Besides, he considering that there must be some subtle spirituous Agent, to bring Things to maturity and perfection, as in the growth and fermentation of Vegetables and their fruit; that by the Depression of this Active Principle, Things are crude and immature, and by the decay thereof decline and die. That Heat, Consistence, variety of Colours, and Tasts; yea the amiable texture of Parts do chiefly depend on a Sulphur. That the Weight, Solidity, and Duration of Bodys without Putrefaction do depend on a Salt, which detaineth and fixeth the Volatile Parts and Sulphur. That Water is a convenient Vehicle for the most active Principles, and to associate them to the Salt. Upon such like considerations hath multiplied the Chymical Principles into Five, *Spiritus*, *Sal*, *Sulphur*, *Aqua* & *Terra*.

Against which multiplication I shall propose these Experimental Observations, proving *Spiritus* to be no distinct Principle from the three former, viz. *Salt*, *Sulphur* and *Mercury*: besides what may be said to his fifth Principle *Earth*.

All

All sorts of Chymical Spirits are reducible to two kinds, *Sulphureous* and *Saline*; of *Saline* Spirits there are two sorts, *Volatile Alkalizate* and *Acid*.

Sulphureous Spirits, such as Spirits of Wine, Rosemary, Juniper; and all *Sulphureous* Spirits got by fermentation out of Vegetables, are nothing but an essential Oyl or Sulphur exalted with a little Phlegm and Salt. This is evident from its Inflammability, which is allowed on all sides to depend chiefly on the Sulphur.

Take Spirit of Wine or Brandy a Spoonful, it will take flame by a burning Paper or Candle, which will continue until all is consumed, except an insipid Water or Phlegm: and the best way of trying the goodness of Vinous Spirits, is by inflammability; which prove better or worse, according as they burn away more or less. Some Chymists assert, they have had such highly rectified Spirits of Wine, that by burning would totally consume away, that the flame would like the containing Vessel dry, leaving neither Fæces nor Phlegm. What difference is there betwixt Sulphur, and *Sulphureous* Spirits; excepting Fermentation and Distillation, by which the subtile parts are separated from the more feculent, but not in an ordinary *Sulphureous* Body, seeing both take flame and burn alike? Tis true, by Distillation the more refine parts are separated, and the *Sulphureous* carry with

with them some Phlegm, and a little Volatile Salt : but that destroyeth not the Sulphureous parts as such, which being the predominant Principle, give denomination to the Liquor, and differ not as to the Principle of Sulphur.

Volatile Saline Spirits, as Spirit of Harts-horn, Spirits of Sal Armoniac; and all Spirits drawn from Animals, as Spirit of Vipers &c. consist of a volatile Salt dissolved in a little Phlegm, with a very small quantity of Sulphur. And that it dependeth on a Volatile Salt dissolved in Phlegm, is thus Apparent. Fill a small Vial with good Spirit of Harts-horn, Sal-Armoniac, &c. let it stand without moving for about half a year, you'll find a Phlegm instead of a Spirit, but the Salt all shot or ChrySTALLIZED to the sides of the bottle; which Salt being dissolved in fresh Phlegm, will become again Spirit of Harts-horn. Besides you may make Spirit of Harts-horn thus, yea as good as the shops will afford. Take of the Volatile Salt shot in the Neck, or to the sides of the Receiver in the Distillation of Harts-horn; mix it with so much Phlegm drawn off, as sufficeth for its dissolution; you'll have an excellent Spirit, which according to the Quantity of Salt dissolved will be stronger or weaker. So that the Phlegm rising with volatile Salt in Distillation, or afterwards mixed with it; liquifieth and turneth it into a Spirit. The same may
be

be said of the Spirits of all Animals, and is manifestly apparent by the Distillation of Vipers, whose Salt sticketh for the greatest part to the sides of the *Receiver*, or head of the *Limbeck*, but mixed with the Phlegm doth become a Spirit of Excellent Use.

This Salt in Distillation carrieth with it a little yellowish Oyl, but by instillation of *Sp. Vini Tartarizatus* is preserved, except the Spirit of Wine containeth a considerable quantity of Phlegm, which will soon dissolve the Volatile Salt of Vipers.

Acid Spirits, as of *Vitriol*, *Vinegar*, *Sulphur* &c. is but an Essential acid Salt liquified by Phlegm, or by Violence of Fire. Spirit of Vitriol is Salt Liquified by force of Fire, which hath freed the Saline from the terrestrious parts; this we may conclude from the Caustick quality both of the Spirit and Oyl; which only differ, in as much as the Oyl is the more Acid part of Vitriol with a little Phlegm and Sulphur and improperly called Oyl, but the Spirit with more Phlegm and less of the Acid Part. And that Spirit of Vitriol chiefly consists of a Salt *in fluore*, is more fully manifest by instillation of an *Alkali*, for Example; pour *Oleum Tartari per Deliquium*, upon Spirit of Vitriol, as in the making of *Tartarum Vitriolatum*, the Acid of Vitriol and Alkali of Tartar combine together into a Neutral Salt, but the Phlegmatick part is evaporated as an insipid Water.

So

So may any Acid Salts *in fluore*, being mixed with Alkalis be revived again into dry Salts, by Evaporation, Precipitation, ChrySTALLIZATION &c. so that Saline Spirits either Acid or Alkalizate, in as much as they contain a Salt highly exalted or volatilised, are called *Spirits, Sal quatenus volatile Spiritus dici potest. Helm. Paradox. 4.*

Against this Opinion *Thales Milesius, Helmont* and others oppose themselves. *Thales* observing Vegetables to grow and flourish by *Moisture*, that Plants fade by droughth and Trees cast their leaves, but after shows of Rain revive, look fresh and green; that *Moisture* is requisite to Nutrition of Animals, that Minerals take their Original and encrease from a concretion of their proper *Succus*, that Stones take their Rise from a petrifying juice: upon such like Considerations hath assigned Water for the Original of Concretes. To which Principle *Van. Helmont* hath added *Se-men*; making the Chymical Principles *Salt, Sulphur, and Mercury*, but posterior products of *Water and Seed*. He telleth us indeed, *Primordialiter duo tantum in Universo esse Elementa aerem videlicet & aquam, à Textu sacro satis insinuata, per spiritum in mundi incunabulis aquarum abyssu supernatantem Paxad. 2.* But then speaking of the Elements as the first matter of Compounds, telleth us by his own experience, he could convert all Concrete body into Water, as into the only and first Principle

ciple. And if so, what becomes of *Earth* the Fourth *Aristotelian* Principle, and the Fifth *Chymical*, according to Dr *Willis*? *Nostra Mechanica* mihi patefecit, arenam, marcasitam, argillam, terram, lapides coctos; vitrum, calcem, sulphur, &c. transmutari in salem actua-lem equiponderantem suo corpori, unde factus est; & quod iste sal aliquoties cohobatus cum sale Circulato Paracelsi, suam omnino fixitatem amittat, tandem transmutetur in liquorem, qui etiam tan- dem transit in Aquam inspidam & quod Aqua ista equiponderet sali suo unde manavit. Plan- tam verò, carnes, ossa, pisces, & quicquid si- milium est, novi redigere in mera sua Tria, unde ostmodum aquam inspidam confeci. Helm. in Elementa. So that by his *Alkabeft*, at least assisted with *Paracelsus's* Sal circulatam he could reduce all Concrets into Water, yea the Tria Chymicorum Principia, whence we may suppose them but secondary things made out of Water, by the efficacy of Seminal Prin- ciples planted ab origine. Lantent in Elemen- torum condo ac ditissimo promptuario, hospitata ab initio rationes in ævum durabiles, scientiâ ve- rum sibi in tempore futurarum instructa, &c. *Helmont Parad. 1.* So that he granteth but Two first Principles (*viz.*) Water for the sub- ject matter, and Semen for the efficient and plastick cause. From this experiment we must necessarily conclude (allowing the truth thereof) That the *Quaternary* of the *Aristote- lian* principles, and also the Tria (for Spirits

and Earth are but products of the other) of the Chymists must fall, excepting that of Water with the Seminal Principles, for we must allow that argument of the *Aristotelians*, into which bodies are ultimately resolved, of such they do consist; but into the Principle Water bodies are ultimately resolved, *Ergo*, They consist of the Principle of Water. For the truth of which Analysis, we have the experience of that profound and learned *Helmont*, who with his *alkabest* could reduce Animals, Vegetables, and Minerals into a pure water: only telleth us, that the greatest difficulty was in the Reduction of the *Sabulum bulliens* or *Quellem*, yet by industry the thing was feasible. *Paracelsus* his Predecessor did arrive almost to that height, who could with his *Circulatum majus* resolve Metals into an Oyl, which *Helmont* by the addition of an Alkali did change into water. Besides the testimony of *Helmont*, led (as he tells us) by thirty years experience, and not trusting to probable conjectures, *Lullius* and others have contended for the same thing, and pretended to have been experienced in the same grand and noble Menstruum. But to lay aside Authority, Reason built upon Experience seemeth to conclude that Water is the main (and perhaps I might truly say the only subject matter of Concretes. Which by the Seminal Principles and ferments thereof is transmuted into this or that Bodie, according to the nature or species

cies of the *Semen* or *Idea* of the *Archeus*. It may perhaps seem a strang Paradox, and a renovation of an old Philosophical Hypothesis exploded by most of the Ancient and Modern Naturalists ; But were it not beyond my intended subject, I might prosecute the assertion and prove, That all bodies in the Animal, Vegetable, and Mineral kingdom do take their material Principle from Water. I mean not that all sublunary bodies do immediately owe their Original to a pure elementary Water ; but either to simple Water, or else to a *Succus sui generis nutritius*, which is matter run through some alterations from that first pure Element of Water. And in this sense are the Assertions of the *Hydroplasticks*, comprehending *Succus* under the notion of Water. I might only propose, Let any man shew me an Animal, Vegetable, or Mineral that I cannot prove to owe its Original immediately to Water, or to a Succus transformed by the Seminal principle into the proposed Object. But shall only instance some particulars, leaving a further prosecution to another's enquiry.

Dr. *Sharrock* giveth us a Catalogue of Plants that would grow and encrease by simple water in a Glass-bottle ; as Mints, *Sedum multifidum*, Pennyroyal, Bugle, Prunella, Water-cresse, *Scordium*, Marsh-mallows, *Nummularia*, &c. '*Sedum multifidum* in a month encreased in weight half a Scruple, *Scordium*

'as much in a fortnight, *Doria* his Wound-
 'wort in six weeks gr. 13. *Bugula* in less time
 'gr. 15. *Water-cress* in a month gr. 25. *Ranuncu-*
 'lus in 6 weeks half a Scruple, *Periwinkle* as
 'much, *Prunella*, *Brooklime* and most of the
 'sorts of *Mint* got weight proportionably.
Shar. Veget. p. 102.

For experiment sake I took several small
 young slips of *Mint* diligently weighed, which
 I kept in Glasse-bottles of fair water the space
 of Twelve weeks, as the water wasted I pour-
 ed on fresh, at the end of which time I weigh-
 ed each Plant for every Slip was now become
 a Plant with large roots and branches) and
 found the former weight of several of them to
 be tripled, but the least of them doubled.

Famous are the Experiments of Mr. *Boyle*.
 'I caused (said he) my Gardiner to dig out a
 'convenient quantity of good Earth and dry
 'it well in an Oven, to weigh it, to put it in
 'an Earthen Pot almost level with the surface
 'of the ground, and to set in it a selected
 'seed, he had from me of *Squash*, which is
 'an *Indian* kind of *Pompion*, which grows a-
 'pace; this Seed I ordered him to water on-
 'ly with Rain or Spring water &c. and a lit-
 tle after giveth us the account of it from his
 Gardiner. 'I have weighed the *Pompion*
 'with the Stalk and Leaves, all which weigh-
 'ed Three Pound wanting a quarter; then I
 'took the Earth, baked it as formerly, and
 found

‘found it just as much as I did as first, which
 ‘made me think I had not dried it suffi-
 ‘ciently, then I put it into the Oven twice
 ‘more, after the Bread was drawn, and
 ‘weighed it the second time, but found it
 ‘shrink little or nothing. *Boyle Scep. Chy.*

He giveth us also another Experiment from
 the same Gardiner in these words. ‘To give
 ‘you an account of your Cucumbers, I have
 ‘gained two indifferent fair ones, the weight
 ‘of them is Ten pounds and a half, the bran-
 ‘ches and the roots weigh’d Four pounds
 ‘wanting two Ounces; and when I had weigh’d
 ‘them I took the Earth and baked it in sever-
 ‘al small earthen Dishes in an Oven: and
 ‘when I had so done. I found the Earth wan-
 ‘ted a pound and half of what it was former-
 ‘ly, yet I was not satisfied, doubting the
 ‘earth was not dry: I put it into an Oven the
 ‘second time (after the Bread was drawn) af-
 ‘ter I had taken it out and weighed it, I found
 ‘it to be the same weight. So I suppose there
 ‘was no moisture left in the earth. Neither
 ‘do I think that the Pound and half that was
 ‘wanting was drawn away by the Cucumber,
 ‘but a great part of it in the ordering was in
 ‘dust (and the like) wasted.

Famous is also that Experiment of *Helmont*:
 Who took of earth dried in an Oven 200
 pound, put it in an earthen vessel, and moi-
 stened it with rain-water, and planted in it a
 Willow

Willow tree of Five pounds weight ; this he kept and watered with rain, or distilled water, to prevent an addition of fresh earth, he covered the vessel with a plate of Tin full of holes. At the end of Five years he dug up and weighed the Tree, and found the Tree, computed with the leaves fallen off in four Autumns, to weigh 169 Pounds, and about three Ounces, and the Earth in which it was set to want only about two Ounces, so that 164 pounds and upwards was the encrease by *Water*.

Had this Tree, or other Plants encreased by simple water been distilled, undoubtedly there had been found the same principles with others of the same Species that sprung in open Gardens or Fields. *Water* we see by these Experiments was disguised by the Plastick virtue of the Seeds into various formes ; as it is evident by the Experiments of Mr. Boyle. ‘ One
 ‘ of the Vegetables cherished only by water,
 ‘ having obtained a competent growth, I did
 ‘ for tryal sake cause to be distilled in a small
 ‘ Retort, and thereby obtained some Phlegm,
 ‘ a little Empyreumatical Spirit, a small quantity of adust Oyl, and a *Caput mortuum*, which
 ‘ appeared to be a Coal, I concluded it to
 ‘ consist of Salt and Earth. And a little after.
 ‘ The water I used to nourish this Plant
 ‘ was not shifted or renewed, I chose Spring
 ‘ water rather than rain-water, because the
 ‘ latter is a kind of *πνευμα*, containing
 steam

'steams of several bodies wandring in the
' Air, and a certain spirituous substance, &c.
Scept. Chym. p. 112. Here are the Chymical
Principles extracted from a Subject, whose
matter before transmutation was Water.

That Water is the material Principle for
the growth and encrease of Vegetables, may
be collected from these observations. *viz.*
Rain-water or Dews refresh the fading Herbs;
That flooding of grounds causeth fertility,
That Grass cut down by the want of a supple-
metal *Succus* soon withereth; That exceeding
Droughts have caused Famines; and that the
Corn of *Agypt* dependeth on the overflow-
ing of *Nile*. And truly whence is the lustre of
the Fields bedecked with flowers, but from
Water transformed into this or that Species,
according to the *Idea* of the *femen*, or *Arche-*
us; for according to the Plastick or Forma-
tive power, Water is changed into roots,
stalks, leaves, yea to make the glorious Lilly.

As Vegetables, so Animals receive their
growth and sustenance immediately from
Water, or else mediately *viz.* From Herbs,
Flesh, &c. which is but Water metamorphi-
zed, and run through former alterations. An
Ox feedeth on grass or plants, *viz.* Water
transformed thereto, a Man feedeth on the
flesh of the Ox, whose material Principle is
but Water transformed into a Plant, thence
into

into Flesh by divers fermentative alterations of the Ox, and now farther according to the ferments of Man.

But to shew more particularly, how that *Water* or at least a *succus* is necessarily requisite to the nutrition of every Animal; Aliment taken into the stomach, before it is fit for nutrition is turned into Chyle, (which is a *Succus*) from whence blood, then Chyme, to be assimilated into each part. As for example, Bread or Flesh eaten by a man, is by concoction turned into a fluid Chyle, by the ferment in sanguification, the Saline and Sulphureous parts work upon each other, and turn the Chyle into Blood; out of which a *succus* is separated, and by the innate ferment of each part assimilated thereto. What is Flesh but a *Leffas* or watery *succus* first turned into Grass, Corn, &c. and at length by succeeding alterations by ferments shaped into Flesh. And the more probable it is, seeing that the Flesh, Blood, Urine or Milk of Animals by bare distillation is turned for the greatest part into Phlegm. The flesh of Eeles (as Mr. Boyle hath observed) by distillation doth yield a great quantity of water, and whilst distilling they seem to boyl like a pot of water, seeming to be nothing else but a congealed water.

The *semen* of Vegetables before roots and branches

branches are formed do require a moist body, which according to the Plastick power of the *Archeus*, doth *Proteus* like turn its shape, and that which was in the form of Water is turned into a Vegetable, which by the Ferments of our body may become blood or flesh, which at length by Putrefaction may be resolved and turned in Worms &c. But even to the generation of Worms and Insects a putrid juice is required.

If we look to the first formation of an Animal, we shall find the *Sperme* to be but a Liquor disguised by the Ferment of Seminal Vessels, which by circulation through the parts of the body whilst blood, is impregnated with an Efflorescence of the whole. And when it is thus prepared, before the *Aura vitalis* can exert its operation, it must have a convenient Matrix as a place, but an Addition of moisture for encrease of the Animal formed.

As Vegetables and Animals have their Seeds, so likewise Minerals in the Bowels of the Earth; and not only to the encrease, but also to the first formation of a Particular in either of these *Species*, we still find a *Succus* required. 'Tis true the Mineral Seeds are inconspicuous and fall not under our sense of *Seeing*. So by an exact enquiry we shall find these of Animals and Vegetables. For the prolifick part, or *Genitura* is properly the *Seed*; but the *Sperme* in an Animal, and the

Grains or Corns among Vegetables, are but convenient Receptacles to lodge the more active part, (which is indiscernable by the best instruments in Opticks) until set at work by some External cause, in its proper place. But however we see by dayly experience, that by the plastick power of the Seeds, a juice is formed into roots and branches: so from Metaline and Mineral Seeds placed in the body of the earth, rather in divers parcels thereof *ab origine*; whence the variety of Mineral Glebes, which turn a *Succus* into their own nature. These Mineral Principles being set at work by the Celestial influence upon appropriate matter, form to themselves a Mercurial Juice and Sulphur, as the more immediate matter to the production of Metals or Minerals, which by the specifick Ferments of the Seeds at length are compleated.

That Mineral Glebes will appropriate a juice, and therefrom perfect a Metal is hence evident. As Earth out of which Nitre is extracted, and afterwards exposed to the open Air will centre upon it the floating Saline Particles; the like effect we shall find upon the *Caput mortuum* of Vitriol, so as to be again impregnate with a fresh Vitriol or Nitre; in like manner Mineral Glebes after the Metal is extracted, will again convert a *Succus* into a Metal: as the Miners of Tin, Lead, &c. can testify, who find a fresh Ore where All was for sixty or seventy years before extract-
ed

ed. Dr. Jorden hath observed, that the Tinners in *Cornwall* within thirty years have found Tin generated *de Novo*, where it hath been all digged up, and the place filled with earth. *Jord. Natur. Bath. Cap. XI.* Many examples he citeth, as the great Income witnessed by *Fallopins*, that the Duke of *Florence* hath by Metals and Minerals produced where all Ore was before exhausted. So also that of the Iron Mines at *Ilva* an Island of the *Adriatick* Sea, where the *Venetians* find Iron generated afresh, yea as fast as they can work it; this is testified by *Georgius Agricola. de Ortus & Cauſ.* *Subr. Lib. 5. p. 61.* Who farther confirmeth the Reproduction of Metals, *Putei ex quibus materia metallo gravida est effossa, aliquot annis eadem replentur.* And a little after; *In Lygiis ad Sagam oppidum eruitur è pratis ferri vena, qua fossa decennio replentur venâ renatâ.* *Agric. Lib. 5. p. 64.* Remarkable also is that of *Eraſtus. Vidi ego argentum purissimum in valle Joachimicâ, in arbore sive trabe cuniculi cujusdam concretum, qua vix ante annos 25 aut 30 ad sustinendum cuniculum ibi collocata fuerat.* *Eraſtus de Medicin. Nov. Paracels. de Metallis p. 19.* That in the Mines of *S. Joachims Valley*, Silver was generated on a Prop of Wood, that had not above 25 or 30 years supported the Mine-works.

We cannot suppose the reason of the new Eruptions of fire after hundreds of years at *Ætna* and *Vesuvius*, and these prodigious
C 2 burn

burnings of the Mountains *Popochampeche* and
Popocatepec mentioned by Mr. Gage in his
Survey of the West Ind. Cap. 13. Except a
 production of Bituminous or Sulphureous
 matter generated *de Novo* is the cause of per-
 petuating these Vulcano's. For else how
 could the fire burn round these Hills, and per-
 haps return violently to the same place it had
 burned in about a hundred years before. It
 must certainly find new matter, seeing that
 in former Eruptions of fire Ashes have been
 cast forth, yea the very stones and earth have
 been as it were calcined to Powder. So that
 we cannot imagine Sulphureous matter to be
 there left, but by the Seminal Principles and
 a convenient *Succus* to be newly begotten.
 But I need not proceed to produce the testi-
 mony of more Authors, as I might out of
Cesalpinus de Metallis, and *Libavius* in his *Al-*
chem. de Metal. seeing most Authors as to this
 particular have allowed a generation of Mi-
 nerals *de Novo*, not approving the Opinion
 of some few, supposing them to have been
 latent from the Creation. The difference is
 whether with *Erastus* in defence of *Aristotle*
 we suppose the matter (before concretion
 into a hard Mineral or Metalline Substance)
 to be a *Vapor*, or with *Agricola* we believe
Succus est ex quo formatur Metallum de Ortu
Subt. Lib. 5. p. 71. but it will not be very mate-
 rial. For if the Matter do arrive to the Mi-
 neral Glebes under the form of *Halitus* or
Vapor;

Vapor ; What is *Vapor* but a *Succus* or moist body, whose Particles are separated and elevated apart, but may be collected again into a greater Bulk by a Receiver, &c. as *Helmont* hath sufficiently proved ? In Distillation of Water the vapour that ariseth is but Water rarified, whose Particles collected in a Receiver make up again a body of Water.

That Minerals may be made out of Water, we have that Experiment cited by Mr. *Boyle* out of *Monsieur de Rochas*. 'I took (saith he) water which I well knew not to be compounded nor mixed with any other thing then the Spirit of Life. By a well proportioned artificial heat I so ordered it, that with it and coagulations, congelation and fixation I turned it into earth, which earth produced Animals Vegetables and Minerals. Here Water was turned into Earth which at length was converted into either of the Three States.

Out of Mercury saith the afore-cited Author, a fourth or fifth part of Water may be obtained without any addition, which for ought he could find, could not be reduced to Mercury ; so that it appeared to be plain Water.

As for that Objection ; why Metals should weigh heavier than water, or that a Spoonful of Quicksilver is in proportion nigh fourteen to one, if Metals should be made out of, or else Water disguised ? This I say doth depend on the Seminal Principles collecting more mat-

ter

ter in less space in some bodies then in others. Bodies which have few Pores or Interstices of parts, but Particles of matter closely united, so they are more heavy or light, although the same Elementary matter compose all, but not compact in all bodies alike. And the inspection through a Microscope on the Pores of bodies will clear up this answer to the Objection.

The first Change of Water in order to Metals is into a Mineral Mercury, the next change by coagulation with Sulphur is into some metal, according to the Specification of the Seed, the repurgation from Sordes or feculent matter, and the tincture of the Sulphur either Solar, Lunar, Saturnine, &c. so the diversity of Metals arise.

Although the foregoing Experiments prove the more immediate matter of Generation and Nutrition to be Water, yet they do in effect prove one material Principle which is the ultimate Result of Water and all other Bodies; as by the Experiment of *Monsieur de Rochas*, and by Conversion of water into the roots and branches of Vegetables may be collected. For as *Helmont* by his *alkahest* could convert Stones, Earth, Glass, yea any body into water; so water may again be transmuted into fixed matter. As it is proved by the encrease of Mints or other Vegetables in water; by *Helmont's* Experiment before cited of a Willow Tree; by *Mr. Boyle's* Experiment

ment of a Squash, in which water is transformed into a body according to the nature of the thing nourished. Yea in the Animal, Vegetable and Mineral Kingdome, as the Aliment is converted into a *Succus*, or at least is a succulent matter before Nutrition; so the *Succus* is again converted into flesh, bones, roots, branches, leaves, or metalline Concrete, according to the individual and its parts of this or the other Species. So that it may be as well urged; That fixed matter is the first Element of all things, as well as Water. For as all Concretes may be converted into Water, so Water may be converted into fixed matter. As for Instance, Vegetables that from a watery nourishment are become a gross and hard aliment taken into the stomach of an Animal is by the ferment thereof turned into a liquid Chyle, which by the ferment of the Heart, &c. is turned into a balsamick blood, and from thence again into bones, flesh, or other gross and fixed Substances.

From the transmutations and reductions of Matter into its pristine form, may be concluded the truth of the Fourth Opinion, viz. of *Epicurus*, and *Democritus*. That *Matter* is the first and only Principle, out of which all concrete bodies are made. And according to the divers figurations, motions, and fixation of the Atoms or minute parts of matter, so are bodies of this or that Species. I cannot close
with

with the opinion of some, that to matter would add *Chance* for a Principle; as if the glorious bodies of the Sun, Moon, Stars, &c. were made by Chance, or by an accidental collection of Atoms, as if a Dog or other Animal were but as a Clock, or other mechanical Engine: but that Matter was shaped at first by the Divine *Fiat*, and is now metamorphized according to the Plastick power of the *Archeus*, or Seminal Principles planted *ab origine* by God Almighty; which by the Celestial influences are set at work, and out of convenient matter form to themselves a Body. We must not rely on Secondary Causes to explain all the secrets of Nature, as Mr. Boyle in his *Usefuln. of Experim. Phil. Essay 2.* hath observed. That Gods power is conspicuous in all Creatures, and even in the least of them the Wisdom of God is manifest.

Des-Cartes telleth us *Materia in toto Universo una & eadem existit. Princ. Nat. Phil. Par. 2. parag. 23.* And a little after, *Omnis materia variatio, sive omnium ejus formarum diversitas, pendet a motu.* Matter in the whole Universe is one and the same, and that all variation or diversity of Forms which matter hath put on, doth depend on Motion. Which Philosophers seemed to observe by their Definition of Nature, *Natura est Principium motus & quietis.* For then they understood (saith he) *Id, per quod res omnes corporea tales evadunt,*

dunt, quales ipsas esse experimur. But then if we consider, what is the First Movent that setteth Secondary Causes in action; we must with *Cartesius*, §. 36. acknowledg God to be the Universal and Primary Cause of motion. Ingenious is his Phansy, That God made all the parts of matter equal in the beginning both in magnitude and motion, which whilst moving by Attrition did break off their angular parts, that became a subtile matter fit to make the Sun and fixed Stars; but these that became Spherical *globuli*, were for the structure of the Heavens; but the parts of matter which by their figures were unfit for motion, did remain gross and fit to make the Earth, Planets, and Comets.

But seeing I have disowned imaginary Philosophy, I shall enquire how far Experience giveth light to this opinion, *viz.* That Matter Indeterminate is the only Elementary Principle *ex Quo* is made every compound Body.

If we take a survey of the whole frame of sublunary Concretes, we shall find *Matter* of it self to be unconfined to any One Species: but the same *Matter* according to the determination of Forms runneth through any Species, and according to the disposition of its parts doth put on the forms of different Elements; which gave occasion to Philosophers so much to dispute the number of Ingredients

in a mixt Body, which really are but Secondary things made out of *Matter*, that first Principle of Concretes.

From that Experiment of *Mr. Boyle Scep. Chym. p. 112.* before mentioned, of his Distillation of a Vegetable nourished only by Water, out of which he procured (according to some) the Five Chymical Principles, *Spiritus, Sal, Sulphur, Aqua, & Terra*; we may conclude thus much, *viz.* That *Matter* which made up the body of Water was converted into Salt, Sulphur, &c.

Having proved before that a *Succus* or Water is the immediate matter for nutrition of Vegetables; Let us take for Example a *Vine*, which requireth a great deal of moisture, as may be concluded from its hasty growth, and bleeding of broken slips. The increase of its bulk is by liquid Sap, which through different strainers and coagulation is turned into leaves, branches, Grapes, &c. The juyce of the Grapes by fermentation will cast a Tartar to the sides of the Vessels, which by distillation will yield a Salt and *Terra damnata*, the Wine will yield a Phlegm and a Sulphureous Spirit; and yet all from the Sap as the more immediate matter. So that here was but one thing in common, *viz. Matter* indeterminate to this or that Species.

As the *Leffas terra* is converted into Grass, so Grass into Chyle, Blood, and after various Alterations into the Flesh of a Brute, whose flesh may be converted again into Chyle, Blood and parts of a Man that did eat of that Brute; and by the corruption of the humane Carcase is turned again into Earth, which may by Nature be again converted into Water, as well as by *Helmont's* Alkahest, and so pass over a new Stage. The parts of this Brute distilled would yield the Chymical Principles, yea the *Aristotelian* so far as they are consistent with truth; as may be easily seen by the Distillation of the Horns, Hoofs, Flesh, and Blood of Animals. In all which changes we shall find One ultimate result, *viz.* *Matter* indeterminate to any One particular Species.

I shall easily grant, That a Body may be made out of Spirit, Salt, Sulphur Phlegm, and Earth; or of Salt, Sulphur, and Mercury, according to others; yet these are but *Elementa secundaria*, seeing they admit of a farther Resolution, as well as a Tree or any compound body admiteth a Resolution into these. That cannot be accounted for a First Element, which deriveth its Original *a Priori*: as from the configuration, disposition, motion, or quiescence of the particles of Matter, not only mixed bodies, but others more simple assigned for Principles by Sects of Philosophers may

be derived. To instance in Particulars, How that the parts of Matter free from cohesion and as it were *in fluore* with perpetual motion make Water ; that the opace gross fixed parts of Matter make Earth, the agile Spherical Particles in a raped motion make Fire, &c. would be beyond my intention. Only thus much we find by experience ; That in generation and corruption there is One ultimate result from all compound bodies, which *Aristotle* rightly called *materia prima*, out of which all Natural bodies are first made, and at last resolved into. As for example ; take a Plant, such as *Mint*, *Pennyroyal*, *Bugle*, *Nummularia*, &c. by a Chymical Analysis it may be resolved into *Spirit*, *Salt*. *Sulphur Phlegm*, or *Water*, and *Earth* ; or according to some Chymists that look a little higher, or to more remote Principles, into *Salt*, *Sulphur*, and *Mercury* seeing that *Spirit* and *Earth* are but Products of the other three. Yet all these as *Dr. Sharrock* by the encrease of Vegetables in pure Water, and the foregoing Experiments have proved, are but Water transformed. And although Water is necessary to Nutrition, and that all Aliment before assimilation to its Substance must be converted into a Liquid, yet Water cannot claim the Property of a First, but Secondary Element, seeing that Water it self is convertible into the Substance of Animals, Vegetables, and Minerals, as these are by *Van Helmont's* Experiment into Water.

ter. So that the Ultimate result in all Corporeal transmutations will be *Matter*, the only constitutive Principle, from which according to the Plastick Power of the *Semen*, or that Divine Impress stamped at first by God Almighty, that is the Formative Cause in Concrete Bodies, is produced the difference of Species and Individuals. Which bringeth me to consider, how cometh the Variety of Animals, Vegetables and Minerals; and the Difference of Waters that our Soil doth afford.

P A R. I. S E C T. 2.

BY the History of the Creation we find that God created the Heavens and the Earth, but first created Matter, out of which He afterwards made bodies different according to their kind. For as Divines tell us, quoting *S. Augustine, Quod calum & terra appellatum est, materies erat confusa quedam de qua mundus (qui duabus maximè partibus calo scil. & terrâ constat) digestis Elementis & acceptâ formâ fabricaretur. Aug. lib. imperf. ad literam de Genesi cap. 4.* "That which was called Heaven and Earth was a confused matter, out of which the world (that doth chiefly consist of two parts, Heaven and Earth) by digestion of the Elements and putting on a form was made. And a little after telleth us, *In principio fecit Deus cælum & terram, id est, materiam quæ calis & terra formam capere posset: quæ materia terra invisibilis & incompleta erat, id est, informis & luce carens profunditas: quæ tamen quoniam moventi & operanti artifice subjecta esset, propter hoc ipsum quod cedit operanti, Aqua etiam nominata est.* The making of the Heaven with its proper form was the work of the second day, *Gen. c. 1. v. 8.* The making of the Seas and the Earth with its vegetables was the work of the third day, *v. 13.* So that the

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Heavens and Earth, mentioned v. 1. must be understood only of the matter, or the dark abyss, on which the Spirit of God moved, in order to posterior formation. And indeed the next following words intimate as much to us. *The Earth was without form and void.*

This undigested Lump of matter the Ancients called a *Chaos*; as we may see by *Hesiod* in his *Theogonia*, by *Apollonius* in *Argonauticis*, lib. 1. lin. 496. who there speaketh to the same effect that *Ovid metamorph. lib. 1.*

*Ante mare & terras, & quod tegit omnia,
Unus erat. ---- (caelum,*

Which are excellently rendred by *Mr. Sandys* thus,

*The Sea, the Earth, all-covering Heaven
unfram'd*

One face had Nature, which they Chaos nam'd.

An undigested lump, a barren load,

Where jarring Seeds of things ill-joyn'd abroad.

I might cite also many more Heathen Philosophers and Poets, which I shall pass by; only taking notice of their Opinion concerning the Seminal principles of Bodies lodged in that undigested lump of Matter. All which I suppose received their opinions from the writings of *Moses*, from whom we are taught, that God created all things; but some he made actually existent, other things he left to be

be produced by the Seminal Principles, which He planted in the Chaos, or confused Matter. As we may see by *Gen. 2. v. 5*, *God made every plant of the field before it was in the earth, and every herb of the field before it grew*, viz. the *semina* of vegetables, which by the primitive *Fiat*, so soon as the Matter was digested into form, were set on work, and brought forth according to the formative vertue of the latent seeds. The Waters brought forth Creatures abundantly after their kind, the winged Fowl after his kind, the Earth brought forth the living Creature after his kind, Cattel and creeping things and Beast after his kind; and of the dust of the ground made *He Man*. Upon all which we find a Divine Impression stamped or Generative faculty, by which they might be *fruitful and multiply*,

The Earth before *Adam's* transgression brought forth of its own accord grass and herbs for the Use of man, which we may well believe to be from latent Seeds, which now are more manifestly requisite to continue the *Species*. After *Adam* had drew a curse on the ground, we still find that the Earth should bring forth, but it should be such as were more useless and unfit for meat, as thorns and thistles: but the more useful plants it should not, unless by humane labour and industry. *In the sweat of thy face shalt thou eat bread. Gen. 3. 19.*

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As God implanted various seeds of Herbs in the earth, which as at first sprung therefrom, so yet from seeds continue their *species*, being set at work by the Divine *Fiat* so soon as the celestial influences and appropriate secondary Causes are rightly applied with convenient Matter ; so in like manner hath God the Creator placed variety of Mineral seeds in divers parcels of Earth, from which cometh a Diversity of Mineral glebes, as here Clay. Marle, there Marcasites of Iron, Alum, &c. as Dr. *Jorden Natur. Bath. and Min. Wat. c. 7.* argueth, That *Minerals have their Seeds to perpetuate their species.*

And that there are Metallick seeds in the bowels of the Earth, may be concluded from the Generation and Maturing of a crude Mercurial and sulphureous juice, until a perfect Metal is formed : As hath been proved p. 18. how the *caput mortuum* of Vitriol, exposed to open Air, will be again impregnated ; and fresh Ore of Tin or Lead, where 60 or 70 years before all was extracted, and old mines replenished with fresh Iron stones. All which productions depend on the Seminal Principles lodged in several parcels of Earth, which from a succulent Matter form a Body according to the Specification of the *Archeus*. The *succus* of the Earth by the operation of the Seminal Agent, is at first converted into a crude Mercury and embrionate Sulphur, which at length

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by maturation doth become a perfect Metal. So from the Esurine or common Salt of the earth, according to the diversity of Glebes, do arise different Mineral Salts, such as that of Vitriol, Alum, Nitre, and *Sal Gemma*.

These Salts being dissolved in spring-water sliding through the veins of the earth, and meeting with a Vitriolick or Aluminous glebe, &c. doth become a natural Menstruum to open the body of a *Minera*. These Salts, as so many Keys to unlock the Mineral Kingdom, make the current Springs impregnated with the vertues of them; and hence is the Original of Medicinal Waters.

Against the opinion of an Universal or one Common Salt of the Earth, out of which all Mineral Salts, according to the different Glebes, are made into different *species*, Dr. *Lister*, *de font. med.* c. 6. objecteth several reasons, and endeavoureth a confutation of *Helmont's* Assertion of an *Esurine* or *Universal* Salt. His Reasons are reduced to four Heads.

1. The Esurine Salt, as it doth participate of no Quality, to assert the existence thereof is but a *gratis dictum*.
2. A *Pyrites* or *Marcasite* cannot perfect its vitriol under water.
3. It is scarce credible that a vein of Iron can be corroded of that Esurine Salt.
4. Vitriol is not made suddenly, or in a moment, but by a gentle assiduous germination.

Against

Against which reasons I shall offer these Experimental Observations, proving that there is an Universal Salt or Common Matter to them all.

1. There is one thing in common among them, because of the Convertibility of one Salt into another ; as a Vitrioline by Alterations may be turned into an Aluminous Salt, witness the making of *Turbith Minerale* thus. Add four ounces of oyl of Vitriol to one ounce of Mercury ; by setting the mixture on a digestive furnace the Phlegm will be evaporated, but there will remain in the Bolt-head a Citrine powder from the Alkalizate Mercury fixed by the acid parts of the oyl of Vitriol. From this powder edulcorated by washings of water, and distilled with Quicklime or Pot-ashes, may be revived a current Quicksilver, yea to its full weight as at first. The water that by washings edulcorated this powder boyled up, yieldeth an aluminous Salt. Here Vitriolick salt is turned into Alum, for the Mercury may be restored to its full weight, so that the Vitrioline is the only salt transformed This is mentioned by Dr. Simpson, *Hydrol. Chym.* p. 60. where an Experiment of his own he giveth thus. " Distill oyl of Vitriol and common Salt with a gentle heat in a glass body or Retort, you will find a very volatile spirit of Salt will come over the helm, which will fume exceedingly, the *Caput mortuum* or remaining

'Salt being dissolved gives a Salt exactly resembling Alum. To which I may annex that Observation of Dr. *Jorden*, *Natur, Bath, c.* 7. That in Distillation of oyl of Vitriol, the Lute wherewith the glasses are joyned will yield a perfect Alum. The affinity (or rather transmutability) of Vitriol and Alum are so great, that he telleth us, it may be doubted whether they are distinct species of Salts.

2. Set several plants in the same soyl, as Scurvigrass, Wormwood, &c. These by distillation shall yield different salts, as the greatest part of that of Wormwood will be a fixed, but of Scurvigrass a volatile salt. Which variety of salts must proceed from the different fermentations and alterations of the nutritive succulent Matter. If it be *objected*, that each plant attracteth a peculiar *succus*, whose particles are answerable to the pores of the Vegetable, and so some Plants take in more of the volatile, and others more of the fixed salt. *Answ.* The same Plants, as Wormwood, Beans, yea I had almost said All vegetables, by distillation yield both volatile and fixed salt, although they differ as to the quantity thereof. For the division of Salts into Fixed and Volatile, is only from the degrees of volatilization. The fixed or *Alkali* salt is not easily sublimed, but will endure calcination in as much as it is deprived of spirits, and incorporated with earth; but the *volatile* is endowed

endowed with spirits, and may be easily sublimed: either of which containing all the virtue of the Plant, may be called an Essential Salt. Yet the proximate Matter before formation might be the Common universal Salt, determined by different Strainers and Ferments of Vegetables.

3. The production of *Sal fossilis* is from the Acid of the Earth, insinuating it self into the pores of stones that are an *Alkali*; it being once penetrated is united with the stony parts into a saline Concrete, which from its transparency is called *Sal Gemma*. Thus an Acid of the Earth sliding through mountains of stone, have converted them almost all into a fossile Salt, as Authors of credit do testifie of mountains in *Poland*.

4. That Salts have something in common among them, may be hence concluded. Expose the *Caput mortuum* of *Vitriol*, of *Nitre*, of *Alum*, and of *Sal Gemma*, to the open air: Each will center upon it the floating saline particles of the Air, or else imbibe a saline *succus*, so as to become again impregnate with a peculiar Salt. So that the saline particles are indifferent to which kind they are to be appropriated by the latent Seminals.

And that all Minerals, stony and saline concretions, do come from a *succus*, which is afterwards congealed into a hard substance, may be concluded from Animals that are found enclosed

enclosed in stones, such as a Toad in the midst of a Stone, a petrified Fish, a Spider in Amber, so also Flies, Worms, Ants, &c. For Stones and Minerals, whilst in *solutis principiis* or *in succo*, may environ an Animal as a petrifying juice doth a piece of wood, which being congealed will be as a coat of defence to preserve them from putrefaction, as *Gilbertus* speaking of Amber hath well described it. *Mollis primum & viscosa materia fuit, quare muscas & vermiculos, culices, formicas, in frustulis quibusdam comprehensos & tumulatos, æternis sepulchris relucentes continet. Qui omnes in liquidum cum primum efflueret involarunt, vel irrepserunt, vel inciderunt* Gilb. de magnete, lib. 2. cap. 2.

Upon such like considerations *Helmont* might well conclude one Common Salt, indifferent to which *species* it should be determined (but not void of Qualities, as *Dr. Lister* urgeth) who assigneth an Acid liquor sliding through the veins of the earth for the Original of all Salts. *Quocirca notandum est. Sal quoddam existere hermaphroditicum metallorum, quod defectu nominis Esurinum sive Acetosum re & nomine vocari cœpit. Generale equidem & ad omnia metalla accommodabile, adeoq; si non primam velut & remotissimam eorundem materiam putare placeat, saltem est metallorum secundina, quibuslibet metallis congenialis.* Helm. parad. 3.

The second argument against one chief Salt,
out

out of which others are formed, is taken from the *Pyrates*, which (saith Dr. *Lifter*) cannot perfect its Vitriol under water. But the making of *vitriolum Martis* or *Veneris* doth evince the contrary. For Vitriol being but a Mineral Salt, that hath preyed on, and combined with a Metal, as with Iron or Copper, the Menstruum may be aqueous, if there be a convenient quantity of Salt therein, to incorporate with the dissolved part of metal. In making *vitriolum Martis*, water added to oyl of Vitriol doth only weaken the Menstruum, that the more soluble parts of Iron may be dissolved and incorporated with the saline parts of the liquor: for were the Menstruum too corrosive, it would insinuate into the body of *Mars*, and make an impure Salt or Vitriol of Iron.

His arguments against the possibility of the Esurine salt dissolving a vein of Iron, suppose no distinction betwixt the crudity and maturity of the *minera*. Although *Aqua fortis* or spirit of *Nitre* will not dissolve Ocre nor the *Hematites*, yet either will strongly ferment with filings of Iron, or the more mature parts of *Mars*. Although the *Hematites* be a sort of Iron-stone, and Ocre be the *Terra metallica*, yet thence it will not follow, that the Menstruum for Iron are the Menstruums for the *Hematites*, which many times is soft and like clay, and the Ocre a meer metalline earth. For Bodies must have their proper Dissolvents,

vents, which may undo the fast and hard texture of some Bodies, but leave untouched the softer *compages* of others: Witness, an Aluminous liquor will corrode a bar of Iron, but leave safe and sound a piece of cloth, as Dyers daily find by experience. So also by the testimony of them, at the Alum-works, a Lee made by the decoction of the calcined *minera* of Alum, is boyled in a leaden Cistern which it leaveth uncorroded; but a furnace of Iron, or a plate thereof put into the boiling liquor is soon torn to pieces. So likewise *Aqua fortis* will corrode a bar of Iron, but leave entire a ball of soft Clay. As this Esurine Acid doth prey upon a vein of Iron, it doth incorporate with the more pure metalline parts, and make a Neutral Salt. To the effecting of which a long tedious delay is not requisite, for we find by the making of *vitriolum Martis*, the saline parts of the Menstruum do soon insinuate themselves into the pores of the metal. Whence *Helmont*: *Constat martis vitriolum sale Esurino embryonati sulphuris & vena (non ferro) ferri, quam sal esurinum adhuc volatile lambendo corrodit, in quo corrosionis actu fit aliqualis dissolutio ipsius vene, & coagulatio sive fixatio salis volatilis.* Helm. Parad. 4.

To the difference of Salts then in the bowels of the earth, these three things do concur.

1. An Esurine Acid, 2. Water to convey this Acid to an appropriate Glebe, 3. a Mineral Glebe.

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As Water impregnate with this Acid runneth through the subterrestrial Channels, and meeteth with a glebe of Alum, Nitre, Marcasites of Iron or of Copper, &c. so it is determined to this or that specifick Salt, whether Alum, Nitre, Sal Gemma, Vitriol of Iron or Copper.

The Esurine Acid thus coagulated into Salt, may by the subsequent streams of water, or by a free Current of the same, bring along with it some particles of the mineral salt, either floating or dissolved in it; the more indeed in case the Minerals are in *solutis principiis* or their Succulencies. If water floweth from a Nitrous glebe, it giveth a cold spring, as many there are in *England*: if from an Aluminous glebe, and bringeth some of the salt thereof, and thereby is the more able to prey on an occurrent *minera* of Iron, it yieldeth *fontes acidulos* or Spaw-waters; such as *Scarbrough Spaw*, *Barnet*, and *Epsom waters*, &c. all which Aluminous waters though Chalybeat work by Siedge. If the Esurine Acid prey chiefly on a *minera* of Iron, the water will be mostwhat Diuretick, and colour the excrements black, such as *Twibridg*, *Astrap*, and *Stallbridg Waters*, among which that near *Ilmington* in *Warwick-shire* may be accounted the principal, no water in *England* being a stronger Chalybeat, as I shall hereafter prove. If water wherein is this Esurine Acid meet

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with no Mineral glebe, as of Iron, Copper, &c. it remaineth only a sower brackish water, which with Galls will strike no Purple. Of this sort there is one famous near *Chesterfield* in the County of *Derby*: the salt of which by ChrySTALLIZATION and Evaporation is of an irregular figure, and not a *Calcareous Nitre* or common Salt, as Dr. *Lister* would have most of our medicinal Fountains to consist of.

But against what hath been said concerning the Esurine Acid meeting with Marcasites of Iron or Copper, and being by them converted into a Vitrioline salt, which may give essence to some Springs, Dr. *Lister, de font. med. Ang. c. 7.* opposeth himself; telling us, that mature Vitriol is not to be found in any of our medicinal Waters, and that he cannot credit *Helmont*, who saith, that by distillation he found *Pauhont* and *Savenir*, two German Spaws, to contain a Vitriol of Iron. His Reasons are intimated to us, *Pyrites qui in aere in merum vitriolum, &c.* "The Pyrites or Marcasite in open air is turned by its proper germination into a meer vitriol, but under water doth as it were dissolve into a spirit, sulphureous *halitus* or Ocre. And afterwards saith, "Vitriol is resolvable into three Principles, Salt, Sulphur, and Ocre; but the Saline principle is only owing to the Germination in Air.

But had the *Dofter* considered, how that Vitriol is found under ground, where we cannot

not suppose a free access of air, (if any at all,) he would not have been so positive in his assertion. For the *Hungarian* and *Cyprian* blew Vitriol is digged up near the Copper-mines; the *English*, *Roman*, and *German* Vitriol, (which last partaketh of a little Copper) lie near to Iron stones. All which without exposing to the air will from their *Marcasites* yield their distinct sorts of vitriol. And what should hinder the germination of vitriol under ground, seeing that vitriol is but a Compound body, of an acid Salt and sulphureous Earth? The sulphureous Earth is but the Ocre or *Terra metallica*, that *Mater ferri vel Veneris*, which receiveth the Acid, and determineth the same according to the Power of the *Semen* latent in the Earth, which may as well convert the Acid of the Earth, as the Saline particles floating to and fro in the air. As for the dissolution of the *Pyrites* in water, I shall easily grant that much of its saline part may be thus resolved, especially whilst it is near its first succulency; but thence see no reason to lay its Original upon the Air: neither could ever find any of these spirits flying off from mineral waters, which the *Doctor* calleth *ipsum metallum vegetans*; for if so, then certainly there might be, by the help of an Alembick and Receiver, such a spirituous substance preserved from fresh Spring-water, which none that ever I heard of could obtain. Tis true, some steams will fly off from mineral

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water,

water, as by our sense of smelling may be perceived, but these *Aporrhea* are but some particles winding off, and are the effect of fermentation or heat, yet cannot be collected retaining the full nature of the mineral ingredient. All mixt bodies are subject to change; by internal or external ferments, and by the active agile parts and motion, many vapours, as in insensible transpiration, may fly off, and enter the pores of other bodies, or perhaps put on a new form, but never could be found an essential spirit of Mineral water,

But by *spirit* perhaps the *Doctor* might mean Ocre, for he tells us c. 7. that Ocre doth evaporate from our Baths, and that spirit which flyeth off is a Metal; and elsewhere will not allow Ocre to be a sulphureous Earth, but a meer Metal, *merum ferri metallum est*. L. *ft. de font. med. c. 2.* because after burning in the fire it may be drawn by the Loadstone. But *Gilbertus* hath proved, that not only Iron, but many other things will answer the operation of the Magnet. *Non ferrum tantum & magnes à magnete attrahitur & volvitur magnetice, sed ferrea vena omnes, lapides etiam alii ut fissiles Rhenani & Andegavenjes nigri, quibus pro tegulis utuntur, aliorumque colorum & substantiarum plurimi si preparati fuerint: cum omnis argilla, glis, saxaque nonnulla, atque ut plinius dicam omnis terra firmior, modò pinguioribus & humidis corruptelis defædاتا non fuerit,*
ut

ut lutum & cænum. And a little after, *Omnia magnetæ attrahuntur solis ignibus preparata, & à recrementis humore liberata.* Gilb. de mag. lib. c. 17. Not only Iron and a Magnet (which is but a more pure *minera* of Iron, or finer Iron-stone) may be drawn by a Magnet; but Stones, white Earth, Potters clay, yea all firm Earth, in case the Excrements and putrid moisture are purged off by fire. Tis true the Operation betwixt the Magnet and Iron is great, and consequently by how much the more of metalline parts of Iron there are in a mineral Earth, by so much the more conspicuous is the Magnetism; yet simple Earth after Calcination will (though in an inferior degree) shew the like effect. But this leading me to the enquiry of a new subject I shall return to my proposed matter in hand.

Du Glos observ. on the Min. wat. of Fran. p. 8. rightly telleth us, "That the first Beings or 'Embryo's of Mineral Salts are nothing else 'but vapours or juices unconcrete, wholly vapourable, And pag. 9. The Embryonate 'Salt in the Chalk-stones is a stony juice, 'which mixeth it self with waters that pass 'between the beds and interstices of the stones 'in the rocks, but is not easily discern'd in the 'waters impregnated therewith. The Seminary of Alum and Vitriol is also necessary in the substances whence these sorts of Salts are drawn. Waters current in their channels meet-

meeting with and dissolving them, become a proper *menstruum* to unlock the Mineral Kingdom; and according to the dissolved *minera*, so Waters differ in their qualities.

Upon the variety of Salts and Mineral Earths dependeth variety of Springs. For there are four sorts of Salt commonly known to us, according to Dr. *Jorden* and others, viz. *Alum*, *Vitriol*, *Nitre*, and common Salt; which others, and perhaps with as great reason, reduce to three, *Alum*, *Vitriol* and common Salt, which last may be again divided into *Sal gemma* or *fossilis*, *Fountain-salt*, and *Sal Marine*, because these three sorts partake near of the same nature, and work almost the like effects. Only the Sea-salt being dissolved in water hath lost many of its sharp points, and consequently is not so penetrating as *Sal fossilis*, from mountains and rocks of which, according to most of our modern Authors, the saltness of the Sea doth take its original. An affinity betwixt these Salts Monsieur *Lemery* hath observed, who also in his *Cour. Chym. Remar. on Salt-peter*, giveth us this Experiment. When *Salt-peter* is boiled a long time in water, and over a great fire, some part of the spirits fly away, and there at last remains nothing but a Salt like unto Sea-salt or *Sal Gemma*, which serves to prove that *Salt-peter* is only a *Sal gemma*, fuller of spirits than the other: And if so, then *Salt-peter* may be ranked

ranked under the other, and make no different *species* of Salt.

From these Salts with which waters may singly or jointly be impregnated, (to which for ought we can tell *species* of Salt as yet unknown to us may be added) preying upon divers Minerals, must needs depend great variety of Mineral waters. As for the Calcarious salt asserted by Dr. *Lister*, I suppose it to be but a kind of *Nitre*, which is centered upon the *Lapis Calcarius* mentioned by *Falopius de Therm. Aq. c.* 8. and by the seminary principle thereof doth become a stony salt, discernable enough by some clear but cold petrifying Springs.

The variety also of Earths, as white, red, or yellow Marle, Clay, Chalk, or other mineral Earths, may cause great variety, as to the weight, colour, sediment, smell &c. more especially when there is a complication of many in the same water.

PART II.

NOW I shall proceed to Enquire, what are the Ingredients of *Ilmington-Spaw*, first taking notice of its Colour, which is far more pale then Rock-spring water. With Syrup of Violets it would turn green, like Alkalizate Liquors with that syrup: with Galls, to a Purple; like Martial Vitrioline Waters: for Cuprous Vitrioline with Galls turn muddy with a very little Purple or Black; but of this more afterwards. Its body being of a thick muddy consistence, I weighed (in a very dry Season) a Pint of this Spaw-water against a Pint of ordinary Water, but the Spaw exceeded near half a Drachm. Another time after a wet Season and when the Ocre was fallen an old Pint pot of common Pump-water weighing 18 Ounces did equalize (and if either, did turn the Scales) the same quantity of the Spaw-water: which may caution us from prefixing a determinate Weight to any Spring-water. Variety in the Weight of Waters may appear by comparing That Salt spring water of *Droit-wich* with sweet springs, yea to him that compareth the Waters of several

veral sweet springs together, For the E. urine salt many times being carried along with the water sliding through its secret *Meanders* or veins of the Earth; of which part insinuateth it self into, and part corroding occurrent bodies; it fretteth off fragments, such as *fragmenta ferrea* from Iron-stones, and particles from ordinary stones, which are carried along with the water, and lie latent to the naked eye in its pores, but by Distillation, Evaporation &c. will appear, Whence of necessity followeth a great variety in weight, according to the greater or less quantity of *sabulum* or fragments therein contained.

Then I proceeded to enquire after the Mineral, with which this Spring was impregnated. And first I took about half a pint of new milk, upon which in a Porringer I poured this water fresh from the Spring-head, but could not discern any coagulation; yea, for any thing did appear, this mixture differed not from a mixture of milk and ordinary spring water. After four miles carriage of the water, when the reddish Ocre began to subside, I poured upon warm milk from the cow a pretty quantity of this water, and let it stand at least twelve hours; but neither in this mixture, nor in milk and this Spaw-water boiled together, did any *Coagulum* appear. Hence I began to suspect, that its brackish taste was not from an acid Salt; therefore on this spring-water I instilled some oyl of *Tar-*

tar, but upon the instillation, and the standing of the water all night, a very small curdling did ensue; only the mixture looked more white than the Spaw-water it self, which alteration of colour proceeded from the oyl of *Tartar*. Whereupon I concluded, that no Acid salt was here predominant, yea rather as such, scarce discernable in this Spring; it being, as I shall hereafter prove, far nearer to an Alkali than to an Acid salt.

Upon an Oaken leaf bruised I poured a pint-glass full of this Spring-water, and immediately it inclined to a Purple colour: I then try'd it with Galls, and it turn'd first to a Purple, but with an addition of more Galls to a black. But desiring more exactness, I caused one single grain of Galls finely powdered to be divided into twenty parts, another grain into nineteen, another into eighteen equal portions, &c. Upon tryal I found, that the eighteenth part of a grain did something incline a pint of this water to a Purple colour, as might be perceived in a chrystal glass set in a clear light; but the sixteenth part of a grain put into a pint of water, did presently cause a tincture plainly discernable and inclining to a purple; but the eighth part of a grain fully turned a pint to a Purple, much resembling in colour Syrup of Damask Roses mixed with ordinary Spring-water. Afterwards the more Galls were added, by so much

much the more it altered towards a black, until it turned into a muddy inky Liquor. Which Liquor by the instillation of spirit of *Vitriol* was cleared, but by oyl of *Tartar* or spirit of *Harts-horn* was again muddied; with spirit of *Nitre*, oyl of *Vitriol*, or *Aqua fortis*, &c. became clear again: for what an Alkali muddieth, an Acid again cleareth.

Now considering the small quantity of Galls, with which a Pint of water was thus tinged, I believe we may compare our new found *Spaw* (in this particular) with any of the English Medicinal waters, yea with the *German Spaws* so much in request.

But it being sufficiently proved by the Learned Dr. *Simpson* in his *Hydrologia Chymica*, that a solution of the *Calx* of Alum, or of Alum-stones with the addition of Galls, will turn to a deep Purple, and from thence with more solution of Galls added becometh blackish and opacous almost like Ink. Upon which spirit of *Vitriol* being poured, it becomes clear again; with oyl of *Tartar* again muddied, and with spirit of *Vitriol*, of *Nitre*, *Aqua fortis*, &c. reduced to its pristine clarity. He also in his *Hydrological Essays* writeth thus. "Not only Galls will strike a purple tincture with the Alum-salt (got before the addition of Kelp and Urine) dissolved in distilled or fresh spring-water, but also the

‘same may be done by other bodies, whose
 ‘texture of parts are congeneal ; as for exam-
 ‘ple, the inner part of the Oak, the roots of
 ‘Tormentile, Avens, Bistort, Clove-gillyflow-
 ‘ers, and the flowers called *Balaustia*. All
 ‘which like Galls will strike a purple with
 ‘water wherein the Alum salt is dissolved, yea
 ‘and will also become clear again by the in-
 ‘stilling a few drops of oyl of vitriol, and
 ‘with the oyl of *Tartar* will become turbid
 ‘and muddy, &c, *Hydr. Ess.* p. 132.

I began to enquire farther into this *Spaw*,
 upon consideration that a Purple colour, and
 from thence a dark muddy liquor like Ink,
 might be made with Galls from another Li-
 quor than from a Vitriolick water or Solu-
 tion. And that Vitriol dissolved, by an ad-
 dition of Galls will strike a good black, is e-
 vident from the ordinary way of making
 black writing Ink, Whereupon I compared
 Aluminous waters and this Spring.

I made a Solution of Mineral Alum with
 fair wter, which presently upon the instilla-
 tion did curdle Milk ; but upon the mixture
 of Milk and this Spring water no Coagulation
 did ensue. And that Alum consisteth chiefly
 of an Acid salt all-sufficient to coagulate milk,
 is apparent by the mixture of a Solution of
 simple Alum salt, with a Solution of salt of
 Tartar, Wormwood, or any Vegetable fixed
 salt ;

Salt ; from whence will arise a turbid liquor with Coagulations in it, which *Coagula* are caused by the mutual conflict of different Salts, destroying each other until a Third and Neutral Salt result therefrom.

Besides, Aluminous Springs are purgative, witness the *Scarborough* Spaw, *Epsom* and *Barnet* Waters, &c. but this near *Ilmington* worketh mostwhat by Urine. Yea perhaps (and truly) I might conclude, That this *Spaw* in respect of its mineral ingredients worketh not by Siedge. I know it may be objected, That some persons drinking of this water do thereupon find a looseness, perhaps to the number of four or five stools or more, To which I might answer,

1. That any simple Spring-water drank in a large quantity, will purge by its own weight: for as it lyeth heavy upon the stomach and intestines it oppresseth Nature, whence the Peristaltick motion is excited to expell that which infests and is burdensome; and if the water doth much oppress the stomach before it pass through the *Pylorus*, vomiting is the effect according to *Dr. Willis*. *In vomitu fibrarum motricium spasmus ab alteris earum finibus, viz. sinistris incipiens & statim violentus & impetuosior factus, totam stomachi cavitatem simul collectam & valde coarctatam, versus sinistrum orificium corripit & illac evacuari cogit. Cujus ratio est, quoniam si quid valde*

incongruum ac natura infestum stomacho insederit, illud non ordinariâ viâ per intestina, ut per anum expellatur, circumferri, verum exitu propiori excerni debet. Willis Pharm. ration. sec. 2. cap. 1. de vomitione. parag. 5. The same reason he giveth for purging by Stool, only by a contrary motion of the Stomachical and intestinal fibres from a less irritation, which motion is continued *usque ad anum*. We cannot say then, that this *Water* is purgative by its Minerals, as I shall more evince when I speak of its Essential parts. For

2. If this *Spaw water* as such, were Cathartick, then it must have the same effects on all persons, allowing a proportionate quantity according to the Constitution of the Party: but that it is not, Experience testifieth. For many find great Costiveness hereby, but a great Secretion by Urine. Yea I have known some persons that have ventured upon five Pints for the first Dose to begin their Water-course; yet instead of a Purge, found their Excrements to come off in blackish hard *Scybala*.

3. To whom this *Water* becometh a Cathartick, they must be either of a weak constitution, soon oppressed by a large quantity of water, or else whose bodies abound with sharp humors (as Scorbutick persons, &c.) all-sufficient to produce a *Diarrhœa* or looseness by a long irritation of the fibres: whence the Peristaltick motion being once excited, Nature

ture as through its common Sink expelleth its peccant matter. For if according to Dr. Willis, not only the *succus Pancreaticus* and *Bilis*, but the serous humors also in their natural *Crafsis*, by Contraction of the tunicles squeezed out of the intestinal Glandules to make the common *Ductus* slippery; and irritating the fibres, do promote Purgation; much more then according to *Sylvius*, when the Saline Principle becomes too much exalted.

To which I might add a fourth Cause, why this *Spaw* should become to some persons, and at some times, a Cathartick, viz. an Inclination to a Lask, whether it be from a Pravity of Humors, Obstructions of the Vessels, *Viscera*, &c.

Besides that, Alum is an Acid, as I have already proved, and also is a Cathartick; both which properties are not to be found in this *Spaw*, comparatively more than in ordinary Spring-water. I observed also, that the Excrements of those that drank this water were turned blackish, which is a consequent to the taking of Chalibeat Medicines, but not to the drinking of Aluminous waters.

For farther tryal I took about two Quarts of this water, and after Evaporation set it to ChrySTALLIZE, but could not find any Salts shot to the sides or bottom of the vessel. I therefore

fore evaporated it *ad siccitatem*, and found left a reddish white powder, upon which I dropped spirit of Harts-horn; but it made no ebullition or effervescence, but with an Acid did make a great ebullition with fumes: quite contrary to Alum, which maketh a plain effervescence with spirit of Harts-horn, but with an Acid stirreth not: which proveth, that an Aluminous Salt is not found in this *Spaw*.

Because oyl of *Vitriol* and spirit of *Nitre* mixed together cause a great effervescence, and from thence spirit of *Nitre* is concluded upon by Dr. *Grew* in his *Tractate of Experiments* to be a Subalkalinate Acid, because also that spirit of *Nitre* and Mercury presently boyl up; it put me upon Enquiry, Whether a Nitrous liquor was the Menstruum to the Mineral of this *Spaw-water*.

But by the way I shall propose one Paradox; taken notice of by Dr. *Simpson*, *Hydrol. Essay* p. 142. quite contrary to the received opinion of vulgar Chymists, viz. That *Nitre*, as *Nitre*, or before it hath suffered the force of fire, is not an Acid. For if *Nitre* were an Acid, then it being put into boyling milk would curdle it; that it will not, Experience teacheth, yea no more than *Sal Gemma*, neither of which do become acid until they have undergone a fiery Tryal, whose spirits drawn off will soon curdle milk. Which seemeth
to

to confirm that opinion of Monsieur *Lemery* before mentioned, . viz. That Nitre is only a *Sal Gemma*, fuller of spirits than the ordinary *fossile Salt*, because when the spirits of Salt-peter by boiling over a strong fire are fled away, there remaineth only a Salt resembling Sea-salt.

That Nitre, before its particles are acuated by the stress of fire, is not acid, may hence appear: because it will make no Ebullition with a Lixivium of Salt of *Tartar*, nor any other *Alkali*, which any Acid will do. And the ordinary way of making *Fixatio Nitri*, by putting a burning coal into the Crucible or Mortar wherein is Nitre, proveth; That when the volatile parts are fled off, (as may be perceived by the great detonation) Salt-peter is become a plain *Alkali* salt.

Neither for my part can I approve of *Schroder's* Definition of Salt-peter. *Sal Nitrum est sal sulphureum seu φλόγισον, salso amarum ex terrâ pingui excoctum.* I know it may be urged, that Salt-peter yeildeth Red fumes or vapours, when its spirits are drawn over the Helm, which seem inflammable and sulphureous; and that Nitre flung upon burning coals will burn most vehemently, and with great noise; and that the strength of Gunpowder proceedeth from the Elastick force of Nitre, its spirits taking their Explosion from the inflammation. To which may be answered,

Answered, That Sulphur is the chief Principle of Inflammability, but This I deny to be in simple Nitre. For about Nitre in a Crucible or earthen pot make *Ignis Rota*, or the most vehement fire that can be; yet the Nitre without an addition of Sulphur shall not take flame and burn, which must have been a necessary Consequent were Inflammability appropriate thereto. Let but a small quantity of Sulphur be added as that of a burning coal, &c. with great impetuosity the volatile parts fly off; even as a great wind that increaseth the flame of combustible matter, but of it self is not capable of accension, so Nitre by its volatile parts like bellows doth blow up the sulphureous parts of a Coal that are the principle matter of Flame. Were these Volatile parts inflammable, then once accended, like other combustible matter in a sufficient quantity, they would totally waste. But in fixing of Nitre it is observed, that as the burning coals waste, so the flame decays; but by putting on fresh coals the flame is renewed, and so until all the volatile parts of Nitre are gone: as Monsieur Lemery well observed, *App. Cour. Chym Remar. on. fix. Nitr. p. 83.* As for the Red vapours yeilded in Distillation, they are not without Sulphur capable of flame, and the sudden Explosion thereof in Gun-powder is from the quick accension of Charcoal and Brimstone, to which doth concur the flatulent Explosion of the volatile parts

parts of Salt-peter in a rapid motion. Arguments against any sulphureous principle of *Salt-peter* might also be taken from the Whiteness of the flame when mixed with Sulphur, and from its cooling Quality, which is contrary to the effect of a sulphureous body.

Upon farther Tryal I could not find Nitre to be any Ingredient in this Spaw. For in the whole Anatomy of this Water by Evaporation, Distillation, Crystallization, &c. I could not find the least footsteps of Nitre, much less any of its Salts shot into its usual *Styria's*. Besides, the Powder left after Evaporation sheweth its self to be far different from a Nitrous salt, as I shall hereafter prove.

But observing this Water after its being exposed to the open air for some time, either stagnating at the Spring-head, or else as it is set in open vessels hath a blewish *Cremor* swimming on the top or surface of the Water, much resembling waters that stand long upon sulphureous bogs; I began to enquire, whether this might not be a Sulphureous Spring, like that at *Knarsbrough*, &c.

By an *Analysis* of this Water into its Principles, not one grain of combustible Sulphur is to be found. In its Distillation in close stopped vessels, the Water that first comes over is insipid, it will not strike a Purple by an addition of Galls, so neither will the Spring-water

when its Ocre is precipitated by being long exposed to the open air, neither will any Sulphureous Smell of the distilled Water strike the Nostriis. What remains in the bottom after Distillation, and also the Sediment precipitated after long stagnation, I tryed with burning Coals and a red hot Iron, but could not perceiue the least flagration. Now were there any Sulphur, (I mean as to the body thereof) it would shew its self a combustible matter on the Top after stagnation, like the *mare Asphalticum*, and in *Italy* the Springs at *Maianum*, *Sassalo*, and at the foot of *Vesuvius*, with many more mentioned by *Dr. Jorden*, *nat. Bat. c. 6.* to which I may add that famous Rivulet spoken of by *Agricola*,

Sulphureâ Nar albus aquâ,---

Nar is white with its sulphureous Cream, *Agr. de natur. cor. Effl. ex ter. l. 2* Or else the Sulphur must subside with the Vitrioline Ocre of this Spring; for as the Water letteth fall its vitrioline Ocre, so it becometh effete in its vertues. But as no Oyl nor *Bitumen*, so neither Sulphur will mix *per minima* with Water; its parts being heterogeneous to these of Oyl or Sulphur: whence there can be no mixture unless by a ferment. The *Compages* of the Water then being dissolved, and by letting fall its vitrioline Ocre becoming effete and insipid, the Sulphur must have shew'd it self by a combustible Cream, or Sediment, had any been there as to its body.

It may be then Queried, What maketh this *Cream* on the top after stagnation, and what is it that giveth a strong Odour to this standing Water?

Answ. A blewish skin or *Cremor* is common to all Vitrioline or other Mineral waters, and to all waters that stand long upon a Bog: which skin taken off, and put upon burning coals, giveth a fetid smell. But as I have said before, Mineral Sulphur as to its body is not here, How comes then this fetid smell? Waters may yeild a sulphureous Cream and smell two ways, *First*, when a bituminous matter issueth forth with the Spring-water, as in the Springs about the *Mare Asphalticum*, at *Auverne* in *France*, at *Pitchford* in *Shropshire*, and at many places as we are informed by *Agri-cola, de nat. eor. Eff. ex ter. lib. 1. and 2.* For the Watery and Oily parts being heterogeneous, there can be no perfect Union; whence the Oyl must either subside, or else turn to a Cream at the top. Or *secondly*, Waters may get a sulphureous Cream and Smell by putrefaction. For Waters, but more especially Mineral, by standing in the air let fall their ingredients, and cast up sulphureous particles to the top. Because the Air by its ferment dissolving the *Compages* of Water, doth generate a Sulphur *de novo*, as in long standing Ditch-water; or else doth cause the particles of *Embryonative* Sulphur, or Sulphur *in fieri*, to swim at the top, (for combustible or Mineral Sulphur

phur I cannot find in this *Spaw*) as of water standing on Bogs, or black moorish ground. So that this Water exposed to the air, may by a putrefactive ferment generate a sulphureous Cream *de novo*, or else cast up its *Embryonative* Sulphur, (all-sufficient to cause the Cream and Smell) which it hath got from the *Marcasites* of Iron or Vitriol, that are the main Ingredient in this *Spaw*, as I shall anon prove. And that *Marcasites* of Vitriol do contain an Embryonative Sulphur, take that Conclusion deduced from Experiments by Dr. *Simpson*, 'That the *Marcasites* of Vitriol and Alum 'have an *Embryonative* Sulphur connatural 'with them, produced out of the same Mineral Seed; for instance, the Sulphur crust, separated by calcination of the Alum-stone; 'and in the Vitriol *Marcasites* I find, that putting them into the fire, they burn of a blew flame, and have a sulphureous smell; in both 'these the Sulphur is really answerable to the 'common Sulphur or Brimstone. *Hydrol. Ess.* p. 61.

But by way of Objection, there is an usual Observation, that may seem to prove the common Mineral Sulphur, and not an Embryonate, to be in this Spring, in case *Marcasites* of Iron do concur to the making up of this *Spaw*, viz. many Iron-stones contain a plain Brimstone, as may clearly be discerned by the naked eye, by the fetid smell and blew flame in burning them at the Forge or Iron Mills.

Answ.

Answ. Although there is found many times among Iron-stones a plain Brimstone, yet we have no Demonstrations to conclude that it is here. But suppose that it should be among the Marcasites, that are chiefly concerned to the effecting this Mineral Spring; yet Sulphur whether in its own proper Earth, or Mineral veins, must have its proper *Menstruum* in order to its Dissolution. Now an Alkalizate Salt (and not an Acid) is the proper *Menstruum* to open the body of Sulphur, that it may shew it self apart: but a Lixivate Salt I cannot perceive to be the *Menstruum* to unlock the *Minera* of this Spring, for then must the Sulphureous part have plainly manifested it self by tinging of Silver and combustible Cream, neither of which are here apparent. And besides, Lixivate liquors are incapable of dissolving Iron, for *Mars* partaketh most what of an Alkali Salt: upon which account Chalybeat Preparations (wherein the Body of Iron is to be opened) do require an Acid *Menstruum*; as the *Crocus* or *Saffrons* of *Mars* with many more might testifie. For let the Preparation of *Crocus* be performed by exposing the Iron for some time to the Dew or Rain, or by spirit of Nitre, Sulphur, &c. yet still by examination we shall find an Acidity in the Dissolvent, by which it is able to corrode *Mars*. The Odour then and Cream of this stagnating Water must be by its small quantity of *Embryonate Sulphur* brought along with

with the *Mineral*, and manifested by a putrefactive ferment. For a *Minera* in its crude parts, or in *succo primitivo*, will sooner shew it self, than in its fast compact substance, that requireth a stronger or more peculiar *Mensurum*.

It being a consequent to vitrioline Solutions to turn to a Purple by addition of Galls, by addition of more Galls to turn dark, and from thence to a thick muddy inky Liquor; I began to Query, Whether this Spring was vitrioline.

As for Vitriol or Copperas I find it agreed upon by the most eminent Authors, to be made of an Acid Salt preying upon a Mineral, whose Particles it combineth with into a close texture. So that a Mineral containing sulphureous Earth, the Parts of Natural vitriol may be concluded, An *Esurine* or *Acid Salt*, *Metalline Particles*, and a *Sulphureous Earth*. According to the Diversity of Minerals, on which the Acid preyeth and combineth with, so different Vitriols do arise. All which (as yet known) may be reduced to two Heads, viz, *Vitriol of Iron*, and *Vitriol of Copper*. *Vitriolum album* hath but little of the Metalline part, and therefore by some is reckoned for a distinct *species*. Because of its Mildness, it may with a little Preparation not only become an Internal Remedy, witness the *Sal Vitrioli vomitivum*, but also may be applied to tender Parts, as it is usual in Eye-waters.

Vitriol

Vitriol of Copper, called by some *vitriolum caeruleum* from its blewish colour, by so much the more it partaketh of Copper the more blew it is, such as the *Hungarian* and *Cyprian* Vitriol. Among the Particular sorts of Vitriol of Copper there is difference, according to the quantity of the Acid or Esurine Salt, and as it partaketh more or less of the Copper.

Vitriol of Iron is commonly Greenish, as the *Goslarick*, *Swedish*, *English*, and *Roman* Vitriols. These partake most of *Mars*, and consequently are not so Caustick as them of Copper, for the more Copper the more Caustick are the Vitriols, and by so much the more fit for composition of Corrosive *Menstruums*. As for instance, the *German* greenish Vitriol, containing more of Iron than of Copper, is reckoned among the vitriols of Iron; but by reason of a small quantity of Copper therein comprehended, is found to be more Corrosive than the ordinary green Vitriols; although far short of the Blew, whose Metalline parts are Copper; yet I deny not, that there may be a complication of Iron with Copper in the same Marcasite.

As for the Red Vitriol our *Druggists* have lately obtained from *Germany*, and by some esteemed as a distinct *Species* of Vitriol, it seemeth to be nothing but a *Terra Vitriolica*, from which the Mineral Salt is separated by

preterlabent Springs, or else is not as yet endowed with an Esurine Acid, but remains as a *Mater Vitrioli* or proper Bed for its generation. By its aspect it resembleth the Cholcothar of *vitriol* of *Iron* which is redish, but that of *Copper* like a yellow Oker,

Besides these Natural *vitriols* already mentioned, there are many Artificial; such as *vitriols* adulterated (by way of cheat) in imitation of the Natural, as much is to counterfeit the *Roman Vitriol*. By Solution, Evaporation, Crystallization, &c. we may find a great deal that passeth for true Natural *Vitriols* to be but Factitious adulterated Compositions by addition of Salts made shoot into strange Crystals with variety of colours,

Notwithstanding that all the sorts of Natural *Vitriol* will strike a Purple, and from thence a muddy Inky liquor by a mixture of Galls; yet I conclude the *white Vitriol* and *Vitriol* of *Copper* not to have existence in this Spring, for these Reasons.

1. White *vitriol* is vomitive, witness the *Gilla vitrioli*, so also is the *vitriol* of *Copper*, yea excepting some Preparations of Mercury the greatest Emetick of Metals: And besides, *vitriol* of *Copper* is a violent Caustick as Chirurgical practice assureth us; neither of which Properties do agree to this Spring.

Secondly, the red Oker that subsides out of
this

this stagnating water, and is to be found among the stones at the Spring-head in a considerable quantity, doth exactly resemble the mineral Earth of Iron, and not of Copper; which is carried along with the Metalline parts dissolved by the Esurine Acid; which Earth as the *mater ferri* because of the body of *Mars* in it, being preyed upon, doth become as a *Crocus Martis* or Rustings of Iron.

If it be Queried, Whether the Mineral of this Water may not be *Copper*, but in so small a quantity, as not to have so powerful an Operation as is required to an Emetick; like spirit of vitriol although a Caustick, yet a few drops may be safely taken inwardly, when there is a large *Latex*, as it is frequently and with good success in cooling Juleps.

Ans. This Spring is very strong of the Mineral, witness the Tincture with so small a quantity of Galls, (as before I have mentioned) any herein not any water in *England* doth exceed; so that were it from an Emetick or Purgative Mineral, as from Alum or Copper, This must have been a Cathartick, but we have no such assurance from Experience. Besides, were it from Copper a great vomitive, then the Mineral being mixed in a less quantity must purge by Stool; for as *Dr. Willis, Pharm. ration. sect. 2. c. 1. de vomitione.* hath proved, When the irritation of the in-

testinal fibres is less than is required to cause a Vomit, it worketh by Siedge. In vomiting the Spasms of the Fibres being violent, Nature is necessitated to evacuate the next way, but less violent by the irritation of a Cathartick, which is not of so quick an Operation, nor so nauseous and offensive to the Stomach as an Emetick; wherefore the Natural motion of the fibres is not inverted, but continued *usque ad Anum* to work by Stool. Now had here been so much Copper as clearly to have manifested it self; this *Spaw*, if not an Emetick, must have been a Cathartick, at least in an inferior degree.

Upon consideration that a Solution of *vitriol* of Iron with Galls would strike a Purple, and from thence a black by addition of more Galls; I began a comparison betwixt this Spring-water and vitriol of Iron, otherwise called *Sal Chalybis*, made out of filings of Steel and oyl of Vitriol.

I took a Pint of fair Spring-water, in which I dissolved a quarter of a Grain of *Sal Chalybis*, then I took a Pint of *Spaw-water*; into each of them severally I put a quarter of a grain of Galls finely powdered, and upon the mixture both became Purple. The mixture with the *Sal Chalybis* turned more to a blewish, but that of the *Spaw* more to a redish Purple, much resembling fair water mixed with a little Syrup of Damask Roses. The dissolution
of

of the *Sal Chalybis* in fair water and the Spaw-water had the same taste, as near as Art could imitate Nature. A small variation in Colour, and as little as may be, in taste may well be allowed, by reason of the redish Oker contained in the Spaw, that upon stagnation of the Water will subside, which must needs cause it to incline something more to a right Purple, and to be something more styptick than the solution of *vitriolum Martis*, containing none of this red Oker. Neither can it be expected, that the Spaw-water, after its Oker is fallen, should be of the same colour with a solution of *Sal Chalybis*. For the Oker that falleth is not a simple Earth, but carrieth with it a great deal of the Mineral and Saline parts; for in so much as the Oker falleth, the Water looseth its Tinging property, yea degenerates from a Mineral water, and at length becometh effete in its vertue.

By addition of more Galls to the Solution of *Sal Chalybis* and to the Spaw-water, both began to turn to a dark, and at last to a black inky Liquor. Then I poured into each a few drops of spirit of Vitriol, and both returned to their pristine clarity; then I instilled upon each a few drops of oyl of *Tartar per Deliquium*, and again they became muddied, but with spirit of Nitre both became clear again. From whence I infer a Similitude betwixt this Spaw-water and a Solution of *Sal Chalybis*

his or Vitriol of Iron, being alike in their variation of Colours, Precipitation, and reduction to Clarity again.

But before I shall proceed to more Experiments, to prove a farther Similitude betwixt this Spaw-water and vitriol of Iron, I shall speak something as a *Rationale*, Why these have alike Precipitation, Variation, and Reduction, which may farther illustrate an Affinity betwixt them from the forementioned Experiments.

Why there is some difference in colour betwixt a Solution of *sal Chalybis* in fair water which inclineth to a Blew, and this Spaw-water (I mean when Galls are added to both) which inclineth more to a Purple, as I said before is from the red Ocre in the Spaw-water. For all Natural vitriol containeth in it a *terra Metallica*, whose Colour may be changed into a brown, black, &c. according to the different *Analysis* of Vitriol by fire. But before any Chymical Preparation of this Spaw-water its Oker is red, as may appear by the Stagnation of the water, to them that make Inspection at the Spring-head,

Now if we look into the Nature of the thing, we shall scarce find any or no difference betwixt the Spaw-water and a Solution of vitriol of Iron. For Blew and Purple are but a Black in a remiss degree; for proof hereof

I could cite the Tryals of experienced Authors, all-sufficient to confirm the Assertion. But instead thereof take one or two Observations.

First, that Blew and Purple do only differ by addition of a little Red, Take a Blew, as *Indy-blew*, &c. ground into a fine powder; which being divided into two parts, add to one part a little Vermilion finely powdered, and it giveth a Purple, by reason that the Blew and the Red particles do refract their rays *intermixtim*, which cannot be distinguished but by good Microscopes. If this be the result from dry Powders, much more then and farther from distinction when Bodies are *in fluxure*, and the Particles of one implexed and insinuated into the Pores and interstices of the other.

Secondly, That Blew and Purple are but a remiss degree of Black, take this Observation to the present business. By an addition of a small quantity of Galls to the Spaw-water, and also to a Solution of vitriol of Iron doth arise a Purple, and a Blew inclinable to a Purple; even so it doth in making of Ordinary ink, when to a solution of Vitriol there is made an addition of a small quantity of Galls, a Purple is the Result, but by addition of more and more Galls it turneth to a Black or inky Liquor. So that Blew or Purple is but a *medium* to a Black, for the same thing by variation in its quantity maketh both.

But

But let us suppose a difference in colour betwixt the Spaw-water and a Solution of *sal Chalybis*; yet that will rather prove a different Position of the Parts of Matter, causing a different refraction of Light, than a Difference in the Nature of the Subjects. For the same Thing by altering the modification of its Particles, may alter its Colour. So Syrup of Violets, by instillation of a little *Oleum Tartari per Deliquium*, changeth from a Blew to a famous Green, A few drops of spirit of Nitre instilled on a considerable quantity of this mixture, or on fresh Syrup, will change it into a Carnation Red. But neither of these Liquors had any resemblance of Red, or Green, before the Mixture, Divers changes in colour I could instance, made by instillation of clear Liquors upon a Decoction of Logwood, &c. and by mixture of Tinctures. By the frequent practice of Dyers we are informed, that the same thing viz. a Decoction of *Glastrum* will produce a Green from a Yellow, and a Russet from a Red, only by a previous preparation with Alum: Yea I could produce a Liquor I have got from a vegetable, (which Experiment I lighted upon by accident, whilst making some scrutiny into Colours) that by instillation of another Liquor as clear as rock-water, will strike an excellent Scarlet; which colour seemeth not to have the least footsteps in the ingredients before they are mixed. Many such like Observations, I question

stion not, may be found by Tryal on mixtures, yea for ought I know to compare with our *Bow-dye*, without the least recourse to *Chochineel*. But this being to dive into the Dyer's Trade, I shall only take notice from such Experiments, That Colour dependeth more on the Texture of Parts differently reflecting the Light, than from a difference in Matter. So that a Blew or Purple will be no Material difference betwixt a Solution of Salt of *Mars* and this Spaw-water, with Galls added to both. And that this Oker is the main occasion thereof, may be hence concluded. I made a Solution of English vitriol in fair water, which with a small quantity of Galls did strike a Purple very near as deep as this Spaw-water: but let vitriol be distilled, and reunite all its parts except the *Colcothar*, and with fair water and Galls you shall fail as to the former Purple; and in all vitrioline Solutions with Galls may be observed, The more *Terra Metallica* the deeper the Purple.

When Galls are added to this Spring-water, and also to a Solution of *Sal Chalybis*, an Alteration in Colour (as I said before) and an inky smell doth also ensue. The reason hereof is this; An inky liquor or Ink (and consequently will smell as such) is made by a solution of vitriol precipitated, or made opacous by the addition of Galls; whose stiptick parts do make *Coagula* with the vitriolick, and hur-

ry the vitriolick out of the former posture, and make them like so many confused Atoms: they also fill these interstices and pores of the water, which before made a diaphanous body, but is now become a turbid, confused, and consequently a blackish liquor. In the ordinary way of making ink, Gum Arabick and Sugar is added to the Galls and vitriol, by reason they cause a thicker consistence, and their glutinous parts buoy up these confused Atoms and *Coagula*, which by long standing would subside, and so the Solution return diaphanous.

The solution of vitriol of *Mars* and Spaw-water, by instillation of spirit of Vitriol, spirit of Nitre, or by other Acids, are reduced to a clear consistence; because that spirit of Vitriol, &c. doth work upon and scatter those confused Atoms and *coagula* made by the Vitriol and Galls, which the Galls had caused to float up and down in a confused posture. Wherefore the Liquors return clear, the Acids having expelled the stiptick and Alkalizate Particles.

By instillation of oyl of *Tartar* these Liquors become again turbid and muddy inclinable to an inky colour. For an *Alkali* precipitates and destroys an Acid, such as spirit of Vitriol, spirit of Nitre, &c. and bringeth into confusion what an Acid had cleared, and doth by destroying the Acid drive out its Particles

Particles from the interstices and pores of the water, and sets them, with them of the Gall as yet unprecipitated into confusion; so that the *coagulum* betwixt the vitriolick parts of the Water and Galls resumes it self. Upon the instillation of spirit of Nitre, both became clear again, and with spirit of Harts horn both again turbid and muddy, for the same reasons before alledged.

Whence I infer a similitude betwixt a Solution of Vitriol and this Spaw-water, as to Precipitations and Reductions by the instillation of Alkalizate and Acid Liquors or Salts.

For farther tryal and proof that this Spaw is vitrioline, and that only, I took two or three quarts of this Spring-water, and evaporated it in an earthen vessel *ad siccitatem*, where it left behind a redish white powder: on some of it I let fall a few drops of spirit of Nitre, and immediately a great ebullition with froth and fumes did arise with a sensible effervescence. Upon the same quantity of powder I let fall some spirit of vitriol, and the like effect did ensue. I let stand a quart of this spring-water in an open vessel, and another quantity in a glass-bottle closely stoped; out of both in a short time I found precipitated a redish sediment, which being dried with the aforesaid Acids did make an Ebullition.

I then forthwith made tryal with the same Acid spirits and *vitriol* of *Iron* or salt of Steel. Upon a little vitriol of Iron I instilled a few drops of spirit of Nitre, and an ebullition with froth and fumes did arise, like as upon the powder left after evaporation, and also upon the sediment of water with spirit of Nitre. Upon vitriol of Iron I let fall a few drops of spirit of Vitriol, but could not perceive any Luctation, either by ebullition, effervescence, exhalation, crepitation, or elevation. But why spirit of vitriol should not ferment with vitriol of Iron, and yet should ferment with the powder left after evaporation of this water, when, as I said before, that the strength of this water consists in a vitriol of Iron with a *terra metallica* or Colcothar adjoynd to, and precipitated with it; the reason is plain. In the making of *sal Chalybis* or vitriol of Iron with oyl of vitriol and filings of Steel, the oyl doth incorporate with the Steel or Iron; and being a strong Acid, and indeed the most Caustick part of Vitriol (and improperly called Oyl) doth ferment with the Alkalizate parts of Iron; and from the combining of these two different Salts a *neutrum quid*, viz. *vitriolum Martis* comes. Now the pores of Iron being fully saturated with the Acid of Vitriol, upon a new instillation of more spirit or oyl no fermentation follows; seeing the iron hath already as it were imbibed as much of the Vitriol as it can,
there

there will not follow any fermentation. For as Water worketh not upon Water, so neither spirit of Vitriol on spirit of Vitriol, the same thing worketh not upon it self: neither can the oyl or spirit work again on the Alkalizate parts of *Mars*, which are already subdued by the Acid of vitriol, and utterly incapable of making a new conflict with it; but will with spirit of Nitre being a subalkalizate Acid, because the pores of *sal Chalybis* are open to it. But why then spirit of vitriol should make an Ebullition with the powder left after evaporation, and upon the sediment, is, because the metallick particles brought from the Marcasites of Iron are not fully saturated with the Esurine Acids in the water, which preyed upon the Marcasites, and brought with it fragments thereof; whose pores are still so disposed, that Acids may be able to close, and by their violent motion divide and as it were tear in pieces, until the contrary salts have embraced each other, and are united into a *Tertium Quid* or indissoluble Texture,

For a farther comparison betwixt this Spring-water and a solution of Vitriol of Iron I took a quantity of Milk, but by mixing with this Spring-water could find no coagulation, either with hot, cold, or boiling Milk. Then I made a solution of *sal chalybis* with fair water, and mixed it with cold milk, with

with milk warm from the cow, and also boyled it with Milk; but neither of them curdled, yea no more than fair Spring-water and milk.

But now it may be Queried, What is become of the Acid, viz. the Esurine acidity? And how comes a Solution of vitriol of Iron not to curdle Milk, when as oyl of vitriol goeth into its composition, which is an Acid; and like other Acids as Vinegar, *Aqua fortis*, &c. will curdle Milk?

Ans. The Esurine salt of the Earth preying upon the Metallick parts of the Marcasites of Iron, so also the oyl or spirit of vitriol in making *Sal Chalybis* on the Iron or Steel; and the vitriol on the oyl of *Tartar* in making *Tartarum vitriolatum*, viz. an Acid upon an Alkalizate body. When they are in a proportionate quantity the conflict betwixt these contrary Salts is great, but the Acid being in a proportionate quantity cannot tear in pieces and shiver the Alkalizate into invisible Atoms, but fixeth its points in the pores of the Alkalizate Matter; yet hath not power to shatter it all to pieces, and free it self from Combinations: but the Parts of the Acid lie sheathed and loaded with the Alkali. So they being closed together, do by their own weight (especially after the Liquor buoying them up is weakened by Evaporation) fall down to the bottom: and by their mutual conflict or ferment

ferment having broken off and dulled the edges of each others Particles, and combined together, do become a *Neutral Salt*.

Some Authors have asserted, That from a *Tartarum vitriolatum* put into a Retort, by the force of fire may be drawn off a spirit of vitriol again : as if the Salts clasping together had not as it were destroyed each others pristine texture of parts, by breaking off and dulling the edges of the saline Particles. Nevertheless Experience proveth, That what is drawn over the Helm from *Tartarum vitriolatum*, is not a spirit like the oyl or spirit of vitriol at the first. For the Taste and Operation of it plainly sheweth, that the *Alkalizate* salt of *Tartar* hath almost wholly taken off its Acidity ; yea I think I might positively affirm, That it is an impossibility from these Neutral Salts, such as *Tartarum vitriolatum*, *vitriolum Martis*, &c. to restore an Acid to its pristine lustre and efficacy.

I said before, when the Acid and Alkalizate Bodies are mixed in a proportionate quantity together : For the Acid in too great a quantity dissolves and destroys all these *Coagula* that it made with the *Alkali*, when mixed in a small quantity. Whilst these Contraries are proportionate, the *Alkalizate* Particles maintained their part against the Acid, so that both lay fixed and free from motion,
but

but by addition of more Acid its strength is increased, so as to scatter and dissolve the Coagulation. And this may be seen, as I intimated before, by instillation of spirit of Vitriol upon this *Spaw-water* or a Solution of *sal Chalybis* with Galls; wherein the vitrioline parts of the Water with the Galls make *coagula*, but by addition of more spirit of vitriol or other Acid are scattered, that the Liquor becomes again clear. The same reason is, when the *Alkali* is too strong for the Acid; it destroys and expells the acid particles floating in the Liquor, and maketh them unable to bear up a conflict. So also when Milk is curdled by an Acid, the Acid hath entered the Cheesy part, and lost its motion; but upon the pouring on of more Acid the Cheesy part will be precipitated, but at last the Coagulation will dissolve away, and quite disappear. Many Instances I might produce, which I shall pass by, seeing they allow the same *Rationale*.

As in the making of *Tartarum vitriolatum* the Salts combine, and work themselves into a Neutral Salt, so also in this Spring-water; where by an Esurine acid Salt acuating the Water is made a Solution of the *Minera* of Iron, whose *Alkalizate* parts combined and clasped with the Esurine acid Salt, are become a *Neutral*. Upon the instillation of a contrary Salt, whether volatile or fixed *Alkali*, the Salts presently make an assault upon each

each other, and by their closing together and taking off their edges by the ferment become a *third* or *Neutral* Salt, In the conflict or duel they thrust forth and partly leave the Mineral body dissolved by the Esurine Acid: which precipitates to the bottom, and carrieth down with it some of the Salts of the *Menstruum*. For more than a *Colcothar* must be here separated, because of the ebullition following an instillation of Acids thereon.

But least that it should be imagined, that there may follow a fermentation by instillation of Acids, because of the *Alkali* added to make a Precipitation, but not belonging to it as a Mineral Water; we must consider, that a precipitation may be made (besides that by dropping thereon or mixing contrary Salts) out of mineral Water three ways: 1. by exposing to the air (which causeth a putrefactive ferment) the Mineral parts will subside; 2. by heat, as in boiling, distilling, &c. the Ocre falls; 3. by motion *ab extra*, as by carriage, &c. The Powder thus precipitated did with Acids make a great ebullition, which could not be from any Salts not belonging to it as a Mineral. Wherefore the Sediment thus precipitated is not a simple *Colcothar*, but with the *Colcotar* do fall some of the Salts of the *Menstruum*: for by pouring on fresh water, and dulcifying the Sediment, a Salt is extracted from the *Colcotar*, that may by Evaporation,

vaporation, Chryſtallization, &c. be brought to a dry body, and exactly answereth *ſal Chalybis* as to its Operation, Experiments, and Effects.

I diſtilled a conſiderable quantity of this Water in a Glaſs Retort and Receiver cloſely luted to it. The firſt Water that came over the Helm I found by taking off the Receiver to be inſipid, which would not with Galls, *Balaſtia* flowers, Avenis, Biſtort roots, &c. like vitrioline waters ſtrike a Purple. Then I diſtilled off more inſipid Water, but to the ſides of the Retort when cooled I found ſticking a rediſh powder, like that I found by Evaporation; the Reſidue of the Water in the Retort by Evaporation *ad ſiccitatem* yielded more. Upon this Sediment dried I let fall a few drops of ſpirit of *Nitre*, of *Vitriol*, oyl of *Sulphur per Campanam*, and *Aqua fortis*; an ebullition with a great efferveſcence did immediately follow. But upon inſtillation of oyl of *Tartar per Deliquium*, ſpirit of *Harts-horn*, or other *Alkalizate* Liquors, not the leaſt ebullition or efferveſcence could be perceived. From which Experiments, as alſo from the former, may follow theſe two collateral Concluſions.

Fiſt, That this *Spaw* like other Mineral Waters by the precipitation of its Ocre or Sediment doth loſe its tinging Property with Galls, and alſo is weakened in its Operation. And although ſome of the Salt yet remain
diſ-

dissolved in the Water after the falling of the Sediment, its former vigour and efficacy is decayed ; for by so much the Water hath let fall of its Ocre and Sediment, (which as I proved before is not a simple metallick earth, but doth carry down with it some of the salts of the *Menstruum*) by so much the water is weakened, and by the falling of more Sediment groweth weaker and weaker in its Operation.

Secondly, from the ebullition and effervescence of Acids poured upon this Powder left after Evaporation, or precipitated by Motion, Heat, or Air ; but upon instilling of oyl of *Tartar* or other *Alkalizate* Salts no fermentation follows ; I conclude, that the Salt in this Powder is rather Lixivial than Acid : although it be (as I have hinted before) a *Neutral* Salt from the combining of the Esurine Acid in the Water and the *Alkalizate* part of Iron, yet like *Tartarum vitriolatum*, or *vitriolum Martis*, it inclineth much to an *Alkali*.

And whereas an Ebullition and Effervescence followed the instillation of Acids on the precipitated Sediment, like as upon vitriol of Iron, or Tartar vitriolated, &c. and that an effervescence and ebullition follows the pouring of oyl of Vitriol on filings of *Mars* in the making of *sal chalybis*, and the oyl of Vitriol upon the Tartar in making *Tartarum vitriolatum* ; both which Compo-

sitions like the sediment of this Spaw will strongly ferment with *Acids*; I conclude it is highly probable, that this Spring, when first it becomes a Mineral water, (which is whilst the *Estrine Acid* preyeth on the *minera* of Iron) is hot: but by long running through a Colander of earth or gravel loseth its heat, and becometh almost a cold Spring. Almost I said, for by comparing the water of this Spaw with other ordinary Spring-water, but especially with a Rock-spring, a sensible warmth may be discerned. And that the *Efferescence* is scarce over at the Spring-head, may be gathered from the Sparkling of the Water in a glass, like bottled Sider newly emptied: and, as I have it by good information, doth much resemble the *German Spaw-water* sealed up in bottles, and brought to *Leyden* and several places in the *Low-countries*.

I took about a Pint of *Ilmington Spaw-water* fresh from the Spring-head, into which I let fall a few drops of Oyl of *Tartar per Deliquium*, which made a white Coagulation dispersed through the whole body; but so small, that it was scarce discernable. I then made a Solution of *sal chalybis* with fair water, upon which I dropped some oyl of *Tartar*, and found a Coagulation in it exactly like the Spaw-water with oyl of *Tartar*. The *coagula* in both by an addition of spirit of Vitriol were dispersed, but by *Alkali's* were reduced &c.

Now

Now it may be questioned, How come *Alkali* Salts, as oyl of *Tartar*, &c. to make these *Coagulum's*, when as spirit of *Vitriol* or other *Acids* cause no *Alteration*?

Ans. There are two sorts of ordinary *Menstruums* for Bodies; Ordinary I say, because I must except *Paracelsus's Sal circulatum*, and *Helmont's Liquor Alkabeft*, the grand Solvents of Bodies into their first Principles.

First, *Menstruums* impregnated with acid Spirits or Salts, whether they be Natural *Acids*, such as the Juice of Crabs, the sour juice of Plants, the Acid of *Marcasites* of Iron, Alum, &c. or Artificially made from natural Salts, as spirit of *Vitriol*, sp. of Sulphur *per campanam*, &c.

Secondly; *Menstruums* endowed with *Alkalizate* Salts, either fixed *Alkali's*, as salt of *Tartar*, *Wormwood*, &c. or volatile, as spirit of *Urine*, *Harts-horn*, or of the horns and hoofs of Animals, *Sage*, &c.

Some add a Third sort of Menstruum, viz. a *vinous Spirit*, which is the common Menstruum for making of *Tinctures* and *Extracts*, because it is apt to imbibe the sulphureous Principle from Compounds. But for my part, I take a *vinous Spirit* not as a distinct Menstruum from the two former. For spirit of *Wine* is nothing but an oyl highly advanced by its volatile Salt, with a small quantity of *Phlegm*. The quantity of oyl is manifest by its inflammability, for good rectified spirit of

of Wine once kindled will almost totally consume. In Distillation the volatile Salt implexed in the sulphureous parts striving to get free, doth tear and divide them, until they be rarified into a Spirit: to which is added a little phlegm, for the better separation of the Salts fermenting and exalting the oyl. Now chiefly for its volatile Salt, spirit of Wine is the Menstruum in making the Tinctures and Extracts of *Senna, Rhubarb, Aloes, Mirrh, Saffron, Hellebore*, and of all dry Roots, Seeds, Flowers, Woods, and Barks. For by addition of volatile Salts the Extracts are stronger, than when made with spirit of Wine only.

Having this premised, I may return to the Question thus; That upon the mixture of Acid and *Alkalizate* Salts they ferment and close together in a Neutral Salt, (as I have already intimated) and forsake or rather thrust forth the Metalline Body dissolved and buoyed up in the Menstruum, which with some of the Salts of the Liquor falls down to the bottom. The Salts combined together and floating up and down in the Menstruum, with some of the Mineral body as yet unprecipitated do represent these *Coagula*: even as oyl of Tartar poured upon a solution of Vitriol made with fair Water, causeth a separation of the Metalline and Colcotarine Parts subsiding to the bottom, and Coagulum of the contrary Salts for a time buoyed up

in the Menstruum. So oyl of *Tartar* with *Ilmington* Water maketh a white *Coagulum*, because it combineth with the *Esurine Acid* of the Water. But the Curdling is very small, because of the small quantity of Acid that doth free, and as it were unsheath it self from the *minera* of Iron; or is yet lodged in the pores of the Water, and is not as yet fixed and joyned to the *Alkalizate* part of Iron,

To try what figure the Salt bore that was contained in this Water, I took about two or three Gallons of the Water, and evaporated it *ad siccitatem*. At the bottom and sides of the vessel I found a redish white Powder, which I dulcified with warm Water: And there was left behind an insipid Earth like red Ocre or Colcotar. The Water I filtred, evaporated, and then set to chrySTALLIZE, which yeilded a Salt of an irregular figure: it was of a palish colour, but as to its operation answered vitriol of Iron.

It being asserted by some Authors (but the Truth thereof I much question) That many Mineral Waters will loose in Weight by carriage, by loss of Spirits as They say; or rather (if at all) I suppose by an *Aporrhea Mineralis*: I filled a glass bottle with this Spaw-Water, and stoped it up close at the Spring-head, where I weighed it with an exact pair of Scales. After four or five Miles carriage

I tryed and found it continue the same weight. After it had stood a day or two, by examination I found the weight not at all diminished: so that by this way, nor by Distillation could I find any volatile spirits, wherein the vertue of this Water consists.

The Bottle thus stoped I kept for a fortnight, and then could perceive the Sediment just begin to fall to the bottom. But in another Bottle carried with This, and left open to the air, I found great part of the Sediment fallen in twelve hours. Which confirms my former Assertion, viz. That not only Heat, Motion by carriage, &c. but the Air also precipitates its Sediment.

Upon Tryal I found, that the Water out of which the Ocre was fallen, would not tinge with Galls; but the Water kept close stoped for a fortnight did with Galls readily strike a Purple, and so would more or less, until the *Terra Metallica* was all fallen.

To sum up then that which hath been laid down, I may say of this Spring, as *Helmont* said of the German Spaws, *Pawhont* and *Savenir*. *Distillavi aliquando serio Savenirium & Pawhontium, & sanè non tantum mineralium catalogum, imò nil quicquam in iis offendi præter Aquam fontanam & vitriolum ferri. Helm. paradox. Quar. de aq. Spad.* So in this Spring the Acid Salt, with which the Water is impregnated, doth in its passage through the subterrestrial channels meet with a *Minera*
of

of Iron, which it partly dissolves, and bringeth along by its Current to the Spring-head. And by a Fermentation betwixt the Esurine Acid and the Metalline Parts of the *Minera* is made a *vitriolum Martis*, which giveth the vertue to this Spring.

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PART III. SEC. I.

HAVING made an Hydrological Essay as to the Essential part of this Spaw-water, I think it not amiss to speak something as to its Vertue, seeing Multitudes resort to the Fountain, and especially the Poorer sort guided by a *Hear-say*, who drink it as a *Catholicon* or Sovereign medicine for all Distempers, not regarding the original of its Source, or what Mineral Ingredients are contained therein.

We are told by the Learned Dr. *Willis*, That by the means of Ferments we are born, bred up. decay and die; that Diseases thence take their Original, and the Restoration of Health is owing thereto. *Nec tantum ratione Fermentorum nascimur & nutrimur, sed & morimur: quilibet morbus virtute fermenti cujusdam suas excitat tragædias.* And a little after, *Quin & morborum curationes fermentationis operamur.* Will. de ferm. cap. 5. I shall therefore only speak somewhat of the Natural ferments of our Bodies, and their Depravations, in order to my present business; but for a large account of them shall refer the Candid Reader to *Willis*, *Helmont*, *Sylvius*, and other eminent

eminent Authors that have fully handled that subject, brevity here being only intended,

As for the Notion of Fermentation take this Definition. *Fermentation is an intestine motion of the Parts or Principles of a Body, with an Inclination to its Perfection or to its Change.* By Change may be understood its Destruction, or Dissolution of its *Compages*, or *mutatio in quid aliud*.

Upon consideration that an entire Function or Office of every Part in the Body is the Effect or Product of *Health*, and that a *Disease* is an Ill Constitution causing an impediment to the Parts in their Function or Office, some according to the diversity of Functions have made a division of Distempers.

The Functions do either respect the Conservation of the Individual, or the Propagation of the Species. These that respect the Conservation of the Individual, are either *Natural*, such as Concoction of Aliments, Sanguification, Secretion of Excrements, Production of Vital Spirits, &c. or else *Animal*, which do respect the Sensitive part of the Creature, as in its External or Internal Senses.

These that respect the Propagation of the Species are peculiar to the Male or Female Sex, and accordingly Authors have grounded their Distinctions.

I shall not proceed in this method, but ra-

ther take a Summulary of Distempers (sufficient for my present purpose) from the Ferments, or rather from the Depravations of them in our body, knowing that a large Explanation would raise a Tractate to a large Volume.

Whereas the ingenious *Franciscus De le boe Sylvius* hath laid down the *Dyscrasia* of the *Lympha*, and of the *Bilis* for the two sole Causes of Fevers either Intermittent or Continual, (under *Lympha* he comprehendeth *Succus Pancreaticus* and *Saliva*) and ascribeth Chylification chiefly to the Salt in Spittle, which by Mastication is mixed with the Aliment or is already conveyed into the stomach, but alloweth of no stomachical Ferment, I cannot assent to be his Profelyte. For considering the structure of the stomach, how that its interior or nervous tunicle hath a *Crusta villosa* or hairy scurf with a multitude of Glandules to percolate and imbibe the Liquors derived from the Arteries and Nerves; we may well suppose an acid Ferment either implanted in, or derived to the stomach from the same vessels that the *Saliva* is. Besides this, *Glisson*, *Willis*, *Diemerbroeck*, yea authors both ancient and modern afford us reasons all-sufficient to believe a stomachical Ferment.

But supposing an acid Ferment in the stomach, or else in the Spittle and so the stomach

mach to be only as a convenient Work-house; it will be all one in a manner, as to the Original and Cures of Diseases that arise from the Depravation of the primary Ferment.

It will be too tedious and beyond my intention to describe the Modes of Fermentations in humane bodies, I shall therefore content my self to enquire, 1. What are the Fermental Digestions of our bodies, and the Depravations of them; 2. The Distempers thence arising; 3. Whether this *Ilmington Spaw* will contribute to the Restoration or Cure of the disordered Digestions.

The Aliment in its way to Nutrition doth undergo several alterations by the Ferments of our bodies, it is several times percolated and as it were strained and purged from its *faces*, after the Changes it hath received, before the Animal spirits, the Instrument of Sensation, and the chief vehicle of the Soul, are elaborated therefrom.

There are three Principal Digestions, *viz.* Chylification, Sanguification, and Production of Animal spirits. Besides, there are others appropriated to particular parts, such as that of the Spleen, Seminal vessels and Prolifick parts, the fermental Digestions of every particular Part, by which it turneth the Nutritive juice into its own likeness. as the saline and tartareous

reous part of the Aliment into Bones; the sulphureous and oily into Fat, the more temperate and balsamick parts (the saline and sulphureous being equally mixed) into Flesh, &c. To which according to some may be added the Ferment of the Reins for secretion of the *Serum*; a Ferment of the *Glandula Renales*; and also in the Liver for a secretion of the *Bilis*, and serous Liquor through the Lympheducts.

The Ferment of the Renal Glandules is only supposed and conjectural; That of the Liver for separation of the Choler, and that of the Kidneys for separating the serous humor may with good reason be believed to be conjectural and fictitious. For when the blood is rightly fermented and in its lax *Compages*, the Liver is sufficient without any innate ferment to transcolate the Choler through its Glandulous Substance, as *Malpighius de Hep.* hath Observed. So also are the Kidneys by the Observations of *Bellinus de Ren*: without any specifick ferment; yea any more then is peculiar to the blood in its Natural *Crafis*.

Chylification I conceive to be chiefly from the Ferment of the Stomach, although other Things concur thereto. How Chylification is performed *Diemerbroeck Anat. Corp. Hum. Lib. 1. Cap. 6.* hath excellently well described. Which in short is thus.

The Meat whilst masticated doth imbibe the

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Saliva or Spittle, which not only softens but impregnates the Meat with a fermentative Quality (that is chiefly by the Salt therein contained) Unto which concureth the Drinks often endowed with acrimonious fermentative Particles. The Stomack receiveth and by contraction of its Fibres closely embraceth the meat thus prepared, and communicateth the fermentative juices from the Coat of the Stomack; to which do concur the Reliques left after former Digestions, which by staying in the Stomack like an old Leaven are brought to an Acidity. The Acid Particles excited by the Heat of the Stomack and adjacent parts do enter the Pores of the Aliment, and ferment with its Saline and Spirituous Parts, until it be dissolved and eliquated into Milky Cream or Chyle: which by Contraction of the Stomachical fibres is sent through the *Pylorus* into the Guts, where it receiveth another Ferment by the mixture of the *Bilis* and *Succus Pancreaticus*; by which the thinner Parts are separated from the thicker and received or rather squeezed by the Peristaltick Motion into the Orifices of the Lacteal Vessels, but the thicker and gross ejected by Stool. This Precipitation and Separation *Sylvius* compareth to a Solution of Vitriol in fair Water, which by the mixture of Salt of Tartar, presently leteth its Sulphureous and dreggy Parts subside.

I shall not then like some take the perfecting of Chylification in the Intestines to be a second Digestion distinct from the former ; but rather a Perfection and Depuration of the concocted Aliment or Chyle. Neither shall I make that little alteration or rather preparation to Sanguification , which the Chyle by mixture of the *Lympha* receiveth from the Mesenterical Glandules and *Ductus Thoracicus* before its ingress into the jugular Veins to be a third Digestion , and distinct from Chylification and Sanguification, but as a Preparative to the Latter with a convenient Vehicle.

The acrimonious Particles of the *Saliva* swallowed , and the Acid Stomachical Ferment , and the Reliques of Aliment of former Digestions sticking to the Coats of the Stomack and brought to Acidity , finding no Aliment to prey upon , do molest and irritate the Stomack ; which molestation being imprest upon the Nerves of the Sixth , or according to Dr. *Willis* the Eighth Pair ; and by these communicated to the Brain , doth excite a desire of Eating or Hungering after Meat , to imbibe the ferment gnawing on the Stomack.

As for the Colour of the Chyle ; or why Mutton , Beef , Bread , Herbs , &c. eaten together should be turned into a white Creamy Substance. Or why the Aliment should not retain its pristine Colour , I conceive to be

be as thus. The Saline and Sulphureous Particles with which our usual Aliment doth abound, being well dissolved and mixed together, do by the Acid Ferment acquire a white Colour. Even as in making of *Lac Sulphuris*, the *Flos Sulphuris* and Salt of *Tartar* by boyling together turn the Water to a dark Red, but by instillation of Vinegar turneth to a white. So every Liquid impregnated with a Sulphur and an Alkalizate Salt, but more especially when the Salt is volatile; or with a Salt well implexed in, and dissolved with the Sulphur, by addition of an acid Liquor becometh white, as may be seen in the making of Resinous Extracts of Vegetables, or by mixing spirit of Benjamin, spirit of Harts-horn, of Soot, or such like spirits abounding with volatile Salt, with an acid Liquor or fair Water.

The Chyle having passed the Stomach into the Intestines, the purer part is received into the Lacteal vessels, (and perhaps some of the more Spirituous parts into the Mesenterical veins, by reason of the sudden refection after eating and drinking by those that are through labour and travel wearied) which convey it to the Mesenterical or *Asellus* his *Pancreas*; and from thence is conveyed by the *Ductus Thoracicus* into the Subclavian vein, where by the way it is mixed with the *Lympha* brought by the Lympheducts, which is not as an use-

less Liquor, but serveth for a vehicle to the Chyle, and by its saline Particles doth prepare it for Sanguification.

The Chyle having once entered the *subclavian* vein is mixed with the recurrent venal blood, and by the *vena cava* is conveyed to the Heart, where is chiefly made the *second Digestion* or *Sanguification*. But first entering the right ventricle of the Heart, from thence it passeth through the *Arteria Pulmonaris* called also *vena Arteriosa* into the Lungs. From whence it is reduced to the left ventricle of the Heart by the *vena Pulmonaris* or *Arteria venosa*, in the *Diastole* or laxation of the Heart it enters the left Ventricle, but by its Contraction or *Systole* is sent forth into the *Aorta*, and by It is carried to the whole body. But the residue after Nutrition is reduced by the veins to the right ventricle of the Heart, from whence again it begineth its Circulation. This is the Natural course in adult persons, but in the *fœtus* or *Embryo* it is something different.

An *Embryo* having not attained to Respiration, nor to a perfection of its Lungs, the Blood cannot Circulate as in adult Animals. Wherefore Nature hath provided two vessels in a *fœtus* that afterward grow obsolete and useles, viz. the *foramen ovale* and *canalis Arteriosus*. The *Foramen Ovale* is placed under the right Auricle of the Heart, and uniteth the

the *vena cava* to the *vena Pulmonaria*. The Use of it is, to carry the Blood that doth not enter the Right ventricle into the *vena Pulmonaria*, that it may enter the left ventricle of the Heart. The *Canalis Arteriosus* uniteth *Arteria Pulmonaris* to the great *Aorta*: whose Use is, to convey the blood that hath passed through the Right ventricle, and is driven by the *Systole* into the great *Artery*, so that it slideth by the left ventricle. By which we may observe, That the blood in its Circulation always entereth the Heart, but in an *Embryo* passeth through only one ventricle.

I said before that Sanguification is chiefly performed in the Heart: for it may with good reason be questioned, Whether the Effervescence of the blood (the Accension, or *flamma vitalis*, as Dr. *Willis* would have it) be from the Heart, or rather from the Fermentation of its contrary Principles, and according to others *Sanguis sanguificat*.

Dr. *Lower* cap. 2. *de corde*. absolutely denieth any Ferment to be placed in the Heart. He telleth us, The Heart oweth its Heat to the Blood, and not the Blood to the Heart; yea that the Blood by its heat doth actuate and enliven our bodies, and that Nature hath not bestowed more heat upon the heart than upon other Muscles: but it hath a more brisk and lively heat than other parts of the

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body,

body, because it is in a continual motion, and so much surrounded with adjacent parts. Neither doth its Action differ from the Action of other Muscles. And *cap. 5.* he telleth us, The Chyle is turned into blood by the vital spirit and other of its active Principles, which from the first Mixture with Chyle do work upon it until it be refined, until the saline sulphureous and spirituous Particles be set at liberty from the feculent, and associated to them of the Blood.

Dr. *Harvey* that exquisite Searcher into the Generation of Animals speaking of the Order of Generation of the Parts of the Body, saith *Ab initio Punctum rubrum saliens, vesicula pulsans fibraqe inde deducta sanguinem in se complectentes &c. Exercit. 50.* That a red beating Spot or Bladder with Fibres thence deduced containing Blood do first of all appear. And by exact observation doth conclude, In the generation of Animals blood is the first thing that is made. And as Pulsation doth begin in it, and from it; so at the last moment of life doth it end in the Blood. *Quantum ex accuratâ inspectione discernere licuit, fit Sanguis, antequam punctum saliens efformatur; idemque calore vitali præditus est, priusquam per pulsum ciatur: atque ut in illo & ab illo Pulsatio incipit, ita tandem in ultimo mortis articulo, in eodem desinit.* Which I suppose gave occasion to Dr. *Glisson* in his *Anat. Hep. Cap. 35.* to assert, That the blood was generated and moved

moved by the heart, but the heart and blood were originally by the Vivifick spirit or juice, which remaineth in the blood after its first production, and is the cause of its future generation: seeing that the Womb by its heat doth excite the Vivifick Spirit of the Seed, and put it in action, which frameth the Seminal Matter into the structure of an Animal. So that the *Quickening* Spirit making the first blood and heart of an *Embryo*, he supposeth it still to perform the same office; according to that Axiom, *Idem quà idem, semper facit idem.*

Against this Opinion *Diemerbroeck Anat. Lib. 2. Cap. 11* doth oppose several Arguments, and endeavoureth a Confutation thereof, and concludeth from his Reasons, That the Blood is generated after, and by the Heart, and not by the Vivifick spirit; which (saith he) inhering in all parts of the body, quickens and disposeth them to their proper functions. So that he concludeth of a *Ferment in the Heart.*

The Learned Dr. Willis telleth us, *Natura posuit in corde fermentum, cujus instinctu seu occurſu sanguis impetuosè effervescit, ac velut in flammam accensus. de ferment. cap. 5.* And in his *Exercitation de Accens. sang. Vitalem sive flammam animæ partem in corde & pulmonibus sedem præcipuam & quasi imperialem habere putamus.* So that he avoweth, the Ferment of the Heart to be the main Cause and Seat of the
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Flamma vitalis, or the Soul's vital flame. But whether it be *in rerum naturâ*, may be questioned.

Variety of Opinions there are about the Motion of the Heart, the immediate instruments of its Motion are agreed upon to be the *Fibres*; but then what sets these *Fibres* in motion, is the τὸ κενόμεινον the main Query or thing sought after.

Some like Dr. *Lower* suppose the motion of the heart to depend upon the influx of Animal Spirits into the Nerves and Fibres, which make a Contraction as in other Muscles. Others suppose it to depend on the Dilatation of the Blood in the Ventracles of the Heart. Others like *Franciscus de Le Boe Sylvius* think to go a middle way, and make it depend partly on the Influx of Animal Spirits, and partly on the Dilatation of the Blood. Others to depend on a *Materia Subtilis*, that subtile Matter supposed to be in continual motion, and to move all Bodies more or less, according as it hath more free or difficult passage through the Pores of them. Others suppose the heart not to move the blood, neither the heart to be moved by the Animal Spirits, nor by a subtile Matter, but by the Vivifick Spirit residing in the blood, and is the cause of its Generation. But *Maurocordatus* not approving the above-recited Opinions supposeth the motion of the heart to depend on the respiration of the Lungs, and the respiration
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of the Lungs to depend on the motion of the heart ; as if the Heart and Lungs did put their help in hand to each others Motion.

To run through each Opinion apart, and to recite the Reasons laid down for confirmation thereof, would be too tedious and beyond my proposed Subject. I shall therefore lay down some Experimental Observations as *Mathematical Data*, and see what Collateral Conclusions about *Sanguification* and *Motion* of the Heart may be thence deduced.

1. *Observ.* I took out the Hearts of two young Puppies about a Fortnight old, and cut off their Nerves to prevent all influx of Animal Spirits, and separated the Coherent Parts. I cut open the Ventricles of one of the Hearts, and let out all the blood therein contained. The Hearts I exposed to the open Air upon a cold Trencher, which did continue beating with a regular *Systole* and *Diastole* as long as warmth continued. When their Motion had almost ceased I breathed upon them, and perceived their motion recruited by the warmth of the breath. When their motion again began to abate, by pouring on warm Water I renewed the same. Thus they continued until the Natural Heat was totally expired ; which was near upon Three Quarters of an Hour after the first exposing out of the Body to the Air. The like Effect I found

found upon the Hearts of Frogs, Tortoises and several young Animals. Yea I cut out the Heart of a young Puppy and of a Frog, and divided them into several pieces, I observed a Motion in a *Systole* and *Diastole* for some Minutes to continue in each part thus separated; and that the pricking them with a Needle did much excite decaying Motion,

2. *Observ.* A Girl about Fifteen years of age, by a Pen-knife had an Artery cut asunder in the Wrist of her hand. With convenient Applications by a Chyrurgion the Blood was stoped, but in his absence the Girl had plucked off the *Eschar*; so that presently followed a great effusion of blood from the Artery. At the return of the Chyrurgion, with whom I was also called; I perceived that she had lost almost the whole mass of Blood of her body. In the time of her bleeding (which was the greatest part of a Day) her Friends about her had given her Sack and Caudle to keep up her decaying strength. At our coming we found, That which the Artery sent forth did more resemble the Caudle than Blood (and so it had been for some hours by the relation of her Attendants) for it was so pale and watery, that it would not ting a Handcherchief red. Her Pulse notwithstanding had small remission. I administered to her Cordials with Spirits to buoy up declining Nature; but before the Chyrurgion stoped

stoped the Blood, she died : which was about One Quarter of an Hour after our arriving thither.

To this I may adjoyn a like observation related by Dr. *Lower, de Cord. motu, cap. 2.* the Sum is thus. " A Youth about sixteen years 'old bled for two days without intermission 'or ceasing. [The occasion of it is not mentioned.] His attendants and friends gave him 'broth to refresh and recruit his Vitals, which 'he eagerly supped down. His flux of blood 'now and then thereby increased, but at 'length the whole Mass was almost evacuated. 'That which run out was pale and watery, neither of the Colour nor Nature of blood, but 'was more like the Broth administered, which 'he drank much of. The flux so continued 'for a day or two, but the Heart in the mean 'time retained its Pulsation. At last the flux 'was stoped, the Party recovered his health, 'and became a stout strong fellow. This he relateth from a Physitian of Credit.

3. *Observ.* Dr. *Lower* in the forecited Chapter giveth us an Experiment of his own. He " drew out of the jugular vein of a Dog 'about half of his blood, injecting the like 'quantity of Ale and Wine mixed into his 'Crural vein. This he continued by turns 'until a paler tincture instead of the blood issued out of the vein, like water wherein 'flesh hath been washed, or like Claret diluted 'with much water.

4. *Observ.* I shall in the next place lay down the Observation of Dr. Harvey, *de gen. Anim. Exerc.* 16. The *Bulla* or *Punctum saliens* (which saith he maketh the Heart) is made before the Brain, that elaborateth the Animal Spirits. The same also doth *Langly. Obs. gen. Anim.* affirm, and common Experience teacheth it. So that although it be questioned, Whether or no the Blood be formed before the Heart, yet it is certain that the *Bulla saliens* is formed before the Brain.

From which Experimental Observations I shall gather these Conclusions.

First, the motion of the Heart *in feri* cannot proceed from an influx of Animal Spirits. For the *punctum saliens*; which is the Heart *in feri*, hath its motion before either Brain or Nerves are framed to elaborate and convey the Animal Spirits to it, according to the *fourth Observation*.

Secondly, neither can the Pulse be from the Accension or Ebullition of blood in the ventricles of the Heart, for according to the *second* and *third Observations*, That which came from the Arteries was far enough from Accension, being pale and dilute like broth, and (as Dr. Lower intimateth) was far from the colour and nature of Blood. From the two Observations before cited from Dr. Lower, Dr. Gibson, in his *Anat. Hum. Bod. Eptom.* l. 2. c. 5. concludeth a full confutation of that Opinion,

Opinion, viz. *Pulsation is from Ebullition and Accension of Blood in the ventricles of the Heart.* Which may be farther denied by the *first Observation*, for the blood was all poured out of the ventricles of the Puppie's heart, so that there was none left to make either Ebullition or Accension.

Thirdly, Neither could the Pulse be from a continued influx of Animal spirits from the Brain. For according to the first Observation, All influx of Spirits was stoped; because the Puppie's and Frog's Hearts were cut off from their Nerves, by which the spirits do flow, if any at all.

Fourthly, Neither can it be from the Respiration of the Lungs; for by the *first Observation*, the Hearts of them Animals cut off from the Lungs, much more the pieces, did yet continue Beating. And in an *Embryo* there is Pulsation of the *Bulla saliens* before the Lungs are formed, and long before they have any Respiration.

Fifthly, Neither from the impression of Subtile Matter, for that concludeth for a general, but not a particular motion; nor why the Heart should keep a Regular *Systole* and *Diastole*. Because the subtile Matter being in continual motion, would press against all the fibres at all times; so that the Heart would remain either in a *Systole*, or a *Diastole*. Besides, as *Diemerbroeck* argueth, This subtile Matter would restore the motion of the heart

whist warm, and so always recover life in creatures that are strangled.

Sixthly, Neither can it be from the vivifick spirit in the blood ; for by the *first Observation*, The Pulse continued after the blood was poured out of the ventricles, and a stop put to all influx of fresh blood. And by *Observ. 2. and 3.* its proved, That when the whole mass of blood was almost emptied, and the rest watery and dilute, the heart retained its Pulse; yet the vivifick spirit of the blood must have been for the greatest part evacuated with the blood.

I shall now proceed to lay down, what I guess to be the genuine cause of *Sanguification* and *Motion* of the Heart, although this may be accounted one of Nature's Secrets, and too abstruse for Us peremptorily to determine. And *first* for Sanguification.

In the begining of Conception, the Spirituous part of the Seed by heat is excited and collected into the *Punctum* or *Bulla saliens* from this Spirit as from a Fermentative substance by the *vis Plastica* or *Archeus* are all the Parts of the body deduced. For according to Dr. *Harvey's* Observation, the *Bulla saliens* is first formed, from which are derived Sanguineous fibres, and one part after another framed, until the whole *Compages* of the Body is perfected. Whether according to the sentiments

timents of Dr. *Harvey*, the blood be first made, and the Heart afterwards for the motion of the Blood, or, according to *Diemerbroeck*, the Heart be made before the first Blood, it is not very material. For on both sides it is concluded, That the *vivifick Spirit* of the *Semen* is the first Former either of Blood or Heart. This *Spirit* having got some Blood for his Vehicle, and being by Heat stirred up and dilated, doth enlarge its Domicile the *Punctum Jaliens*; for being too close pent up doth endeavour for an eruption by particular assaults, which is the first cause of Pulsation. As the Ferment is increased by the addition of new Matter from the *Colliquamentum Seminis* at first, and other Matter afterwards; so the vivifick Spirit doth farther dilate it self in the blood, until it hath formed the Veins and Arteries for its Channels, and as a Workman, according to the Divine Impress stamped at first by God Almighty on blind Matter, or by the Direction of the *Archæus*, (as *Helmont* calls it, but as for the Name of that Directive Power call it as you please) hath made every part of the whole Body. This vivifick acrimonious Spirit doth not only forme out of convenient Matter, but also inhere in the Parts formed, more or less, and giveth to every Part a peculiar Property or Ferment, as That of the Stomach for *Chylification*, That of the Heart for *Sanguification*, &c.

But

But suppose that the first blood should be formed before the *Punctum Saliens*, and the Heart contribute nothing thereto. Yet it must be granted that Things proceed other-ways in Adult Animals, then they do at the first formation. As for Instance; There is Motion before the Brain or Nerves are formed, yet none now deny that Office to the Brain of elaborating the Animal Spirits that serve for Motion. The *Embryo* is nourished and encreased before the Stomach and other parts serving for Concoction are made; yet after they are made in a perfect *Fœtus* and in adult Persons, none except through a Spirit of Contradiction will deny them to serve for Concoction; so that the Heart by his Acrimonious Spirit implanted therein may serve for *Sanguification*, which I imagine to be as thus.

So soon as the Chyle is mixed with the Blood, the Vital Spirit and other active Principles do work upon the Chyle to assimilate it to its own nature. By the Stomachical Ferment the *Salt*, *Sulphur*, and *Spirit* of the Chyle are almost set at liberty from the grosser parts of the Aliment; so that the Active Principles of the Blood soon add to their Exaltation. When the Chyle with the Venal blood is entered the right ventricle of the Heart, the Heart addeth a new Ferment thereto; and sendeth it into the Lungs, where it receiveth a farther Alteration from the Nitrous Particles
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of the Air admitted by Inspiration, and intimately there mixed with its *Compages*, where the blood also receiveth from the Air its florid Colour : As may be seen by several Experiments of Dr *Lower's*, and also by exposing Venal blood to the open Air, for the superficial part next the air will be of a florid Red, but the under part of a Blackish colour. Let the blackish part be turned to the air, and its *superficies* will be of a light red. In the left ventricle of the heart it receiveth a more perfect mixture, and entereth the *Aorta* under the form of Blood, and is of a Scarlet colour, until the air is transpired through the pores of the skin. But Chyle is not perfectly and exactly assimilated to the blood, until it hath run through many Circulations.

The most subtile and acrimonious part of the vivifick spirit planted in the heart from its original giveth its Ferment, by which the humors receive an Effervescence and Dilatation (if capable thereof) and more or less as they are inclinable thereto. Even as Gunpowder that of it self hath no heat, but by fire doth soon dilate and hath a great effervescence : So doth the blood by the ferment of the heart, and by the dilatation of the blood the sides of the ventricles of the heart are molested, and the fibres of the heart are irritated and provoked to expel the oppressing blood. After the expulsion the Heart remains in its
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Diaſtole, until by a ſupply of freſh blood there is a new Dilatation and then a *Syſtole*. But to a *Syſtole*, beſides the vivifick Spirit inherent in the Heart, the Animal ſpirits as in other Muſcular motion are called in to help, ſuppoſing a free paſſage; for elſe what meaneth ſo many Nerves derived to the Heart.

The Hearts of Puppies, Frogs, &c. cut from their bodies, and the ventricles emptied from blood, will keep (as long as natural warmth) their Pulſation. Becauſe the vivifick acrimonious ſpirit placed in the Heart, by heat is ſet on work to ferment and dilate the blood contained in the Pores and Interſtices of the fleſhy ſubſtance of the Heart, and by irritation of the fibres is made a *Syſtole* and then a *Diaſtole* until the blood contained in the Pores do ſuffer a new Dilatation; to which both vital and Animal ſpirits as yet unſpent, that will make a tremulous motion for ſome time after the death of an Animal, do concur.

The Third principal Fermental *Digeſtion* is That of the Brain, which is well appointed with blood-veſſels, that ſerve as Channels to convey Matter to every part of the *Cerebrum* and *Cerebellum*. Nature hath ſo provided for a ſupply of Matter, That as Dr. Willis hath obſerved, *Non modò arterias cum venis, verùm quod rarius & ferè ſingulare eſt, arterias cum arteriis; nempe arterias Carotides unius lateris*

pluribus in locis uniuntur cum carotidibus alterius; insuper vertebrales utriusque lateris inter sese & in posteriores carotidum ramos prius unitos inosculantur. Anat. Cereb. c. 7. From the blood thus conveyed by the Carotidal and Vertebral arteries, the purer and more subtile Spirituous part is carried into the Brain by the winding Meanders of the Arteries, whilst the Grosser part is absorbed and carried back by the Veins, and the *Serum* imbibed by the Glandules and Lympheducts, in order to be restored to a fresh Circulation. The manner how the Animal spirits are produced Dr. *Willis de ferm. c. 5.* sheweth by a Similitude. As in making highly rectified spirit of Wine with a glass Alembick, a Sponge being put into its Pipe, only the most subtile part can pass; so from the hot rarified blood, only the most Subtile spirit (as it were distilled) can pass through the Cortical substance of the Brain. This Liquor thus distilled doth obtain a higher degree of perfection, because the Brain abounding with a volatile Salt doth much exalt these distilled Spirits; so that they are as it were endowed with a Ferment, and by their volatile Salt penetrate like Spirit of Harts horn, more than Spirit of Wine.

Cartesius seems to refer it to the *Glandula Pinealis* separating the Spirits from the *Plexus Choroides*. But his Opinion being so wide from Truth, as may be soon made appear by a

trutiny into the Nature of Glandules, I shall pass it by.

Riolanus would ascribe it to the ventricles of the Brain; but for a full consutation thereof I shall refer the Reader to Dr. *Wepfer, de Aplexia*, only adding this Observation of my own.

I was called to a Youth about eight years of age, whom I found much complaining of a heaviness and Dulness of his Head, with a great inclination to sleep. His head I observed to exceed in bigness all the other parts in a considerable proportion. The Distemper I found to be a *Hydrocephalus*, and from the Symptoms might easily perceive it a fore-runner of Death, that did soon ensue. I opened his Head, and before sufficient Testimony poured out of the ventricles of the brain near a full pint and half of clear *Lympha* like Rock water: which would certainly have hindred any operation of Animal spirits there, and all communication into the Nerves from thence, especially seeing his Senses remained clear, and his head for a long time gradually increased. It is probable then it is that the Animal spirits are elaborated in the Cortical or Ash-colored part of the brain, by the saline ferment and percolation through the pores of the matter. So that the Animal spirits only by their high exaltation and purification differ from the Vital spirits, which latter are the basis of the former.

Spirits

Spirits thus elaborated are by others succeeding them impelled into the medullous part of the brain or *Corpus callosum*, where they have a large place to exercise the *Phanfy*; in the *Plica* of the Brain to lay up *Idea's* for the *Memory*; and in the *Corpora striata* to exercise the *Sensus communis*; and according as they are directed along the Nerves to perform Motion, or as they receive Impressions undulating backward to perform the External Senses.

Probable also is the Opinion of *Willis* and *Diemerbroeck*, That there is a *Succus Nervosus* or Nervous juice, serving as a spirituous ferment to separate the Nutritive parts from the Blood. As the Blood supplieth Matter, so the Nervous Juice is as an Active Form in Nutrition. And good Reason may be given for this Opinion; for in a *Palsie*, wherein the Nerves are obstructed, although the Parts are imbued with a constant supply of warm blood, yet the Parts will fade away for want of Nourishment assimilated to them, as a supply to that which was lost; because the *succus nervosus* is wanting, which precipitateth the Nutritive Matter from the rest of the blood.

Next to the three principal Ferments cometh in That of the Spleen. As for the opinion of *Dr. Glisson*, *lib. de Hep. cap. 45.* that the Spleen doth prepare an Alimentary juice that is imbibed by the Nerves, and by them carried

up to the Brain, and back again through the Nerves to the parts of the whole body, to me it seems irrational ; that the same juice should be carried to and fro through the same vessels, and that an Acid juice (for such is that of the Spleen) should be supposed to be a vehicle for the Animal Spirits that are a volatile *Alkali*. The proper Use then I imagine as thus.

The Spleen by its Ferment placed therein *ab origine*, doth with the Nervous juice deposited in the Glandules by the extremities of Nerves terminating in them, cause an Acidity in the blood brought by the Arteries. By which Acidity the *Bile* consisting much of retorrid lixivial Salt, is hastened towards a separation, even as by mixture with other *Alkalis* and *Acids* may be seen: so that the blood reduced from the Spleen by the *Ramus Splenicus* doth in the Liver soon make a Secretion of its Choler.

An Acid Ferment may well be supposed in the Spleen from its natural structure; which is chiefly made up of membranous Cells like the holes of a Hony-comb, about which the ends of the blood-vessels are twisted like the Tendrils of a Vine. Now here the Glandules, as in other parts of the body, may be well supposed to contain an Acid juice, and may the sooner impress its ferment on the blood by its little stay in the cells, before it is carried away with the subsequent streams. For a large account

count hereof I shall refer the Reader to *Malpighius de Liene*.

The Seminal parts both in male and female seem to be highly endowed with a Ferment; insomuch that the *Sal*, *Sulphur*, and *Mercury*, are as it were exalted into a noble *Elixir*, from which the *Embryo* taketh its rise; I mean the *semen* in males and the *ova* in females, for both by the ferments of the Genital parts are elaborated out of blood. The manner how is too large for me here to describe, and may be seen in ample manner in *Harvey* and *de Graef*.

It is beyond my intention to take upon me here to dispute, whether or not Milk is made by a bare transcolation through the Mamillary Glandules, or by an innate Ferment of the Dugs; or how the *Bile* is separated in the Liver, or whether all the Glandules of our bodies are endowed with a Specifick ferment. But this we may lay down as a Truth, *viz.* That the *Archæus* in the first formation hath bestowed on every Part a peculiar configuration of Pores, and a fermental Digestion to receive its proper Aliment, and convert it into a similar substance to repair that which was lost, and hath assigned a peculiar Office to every particular part.

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PART III. SEC. 2.

AS from the fermental *Digestions* in their full vigour and lustre the Organs have that which is requisite to their functions, and consequently Health is entire ; so from their diminution and depravation Distempers take their Original. The Concoction of the Stomach and other fermental Digestions of the body may suffer by the inordinate Use of the *Sex Non-naturalia*; but I shall take a short survey of Diseases as they are immediately derived from the disordered Ferments.

The Stomachical Ferment may be vitiated, so as to leave a twofold Errour on the Aliment, viz. *Crudity* and *Over-acidity*, which concur to laying the foundation of many Distempers. In this sense I mean, viz. That All Diseases cannot be immediately derived from This, or the Other particular ferment, but that the Generality of Distempers owe their original to the Error of Fermental Digestions, the one many times concurring as a Procatartick, and another as a Proximate cause.

When the Stomachical ferment is debilitated, the Aliment receives an imperfect Con-

Concoction ; whence a *flatus* is excited and a Pain in the Stomach, with an inclination to vomiting and abhorrence of Dyet. If it pass thus crude through the *Pylorus* into the Intestines, it lays a foundation of a *Diarrhœa*, *Worms*, *Obstruction* of the *Misentery*, &c.

An Error in the first Concoction cannot be corrected in the second ; wherefore the crude Alimentary juice being conveyed through the Lacteal and Thoracical vessels, and so away to the Heart, doth cause a spurious and febrile conflict with the Principles of Sanguification ; and according to the quantity of the depraved Aliment, that in 24 or 48 hours &c doth rise *ad turgescentiam*, and able to vie (as it were) with the blood, so it giveth the difference betwixt Quotidian, Tertian, or Quartan Agues, &c. as several modern Authors have observed. And as it is a cause of Intermittent, so also it layeth a foundation of Continual fevers, according as the Principles of the blood by this depraved Ferment become too much exalted. For if the Spirituous part be highly inflamed, then a *febris Synochus* or *Ephemera* ; if the Sulphureous part be exalted, or a Putrefaction of Humors in the blood-vessels, then a Putrid fever ; if a contagious *Miasma* be added, then a Malignant fever, such as the Plague, small Pox, Measles, But whether this vitiated Juice be made so by the vitiated *Bilis* and *Lympha*, as *Sylvius de*
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leboe would have it, is not to my purpose to dispute.

If the vitiated *Succus Nutritius* arrive to the Brain, and by Obstruction of the Pores hindereth the Third Digestion, viz. the elaborating of Animal Spirits, or stop their motion, or subvert the volatizing Ferment of the Brain, it causeth an *Apoplexie*, *Lethargy*, *Coma*, or *Carus*. And according as the Nerves are obstructed, and the Spirits with their vehicle the *succus Nervosus* defiled and stoped in their passage, thence a *Palsie* great or less. And as the vitiated juice hath passed the Cortical substance of the Brain, and is confused with the Animal spirits, so as to cause an irritation of the Nerves and explosion of the Animal spirits, it causeth *Epilepsies*, *Convulsions*, &c.

To these Distempers the depraved Ferment of the Spleen doth contribute; for when the bilious Particles are not evacuated, but by long fermentation become retorrid and gross, then the Melancholy adust terrestrious blood subverteth the refined Texture of the Animal spirits, and bringeth on them a mighty gloominess, whence *Melancholy Phancies*; and as it impresseth its *labes* on the Spirits and *Genus Nervosum*, so it concurrereth to *Hypochondriacal Fits*, and many Nervous diseases.

Every part in the body receiving a *Succus Nutritius* from the blood is deprived of its due

due nourishment, when the fermental Digestions are deficient, and the Aliment unprepared: instead then of assimilating the *succus nutritivus* to each Part, it being a *succus depravatus* doth instead of assimilation cause *Aposthumations, Tumors, Ulcers, &c.*

As the too much debilitated, so also the too great or over-acidity of the Stomachical ferment will be as a Ground-work for many Enormities. A proportionate Acidity (as I intimated before) is a cause of Digestion; so too great, and especially when alienated from its natural *Crafsis*, is a cause of Coagulation, Precipitation, and Fixation, and consequently of Indigestion. Besides the *Appetitus Caninus* caused by an exorbitant Acid gnawing the stomach; and the *Pica* and *Malacia* from a depraved Ferment, causing an inordinate appetite after objects unfit for Aliment, as *Chalk, Stones, &c.* a parallel instance may be given (of Precipitation, Coagulation, and Fixation of the Aliment by too great acidity of the Ferment,) I mean that of our Cooks *Pickling*, as of *Sampier, Cucumbers, &c.* whose Pores are filled with the points of the acid Particles fixing themselves in clammy matter, which put a stop to an ingress of fermentative Particles from the Air that may tend to the dissolution of the *Compages*, and so are as a coat of Defence from putrefaction. And as the aereous particles are not allowed free passage, so

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neither are the fermentative particles of the Stomachical Digestion admitted to enter, and raise a luctation with the active principles of the Aliment, whose parts are as it were linked together by the acid particles of the *Pickle*, that the Stomachical ferment cannot tear them in pieces, except when they are taken in a small proportionate quantity, and not able to out-vie That of the primary Digestion. A like Instance may be taken from salted and dried meats, as *Beef, Bacon, &c.* which we find of a hard Digestion, and unfit for a weak Stomach, because its parts are tied together and pores obstructed by saline Particles, and not to be freed and set in motion without a Ferment stronger than the Coagulation.

And that the Depraved ferment by over-acidity in the primary Digestion is a cause of many disorders, yea whilst in the stomach affecting its Orifice causeth *Ructatio acida, Cardialgia, Ardor cum dolore, &c.* may be concluded from their cure by fixed *Alkalis*, as *Sylvius* doth observe, whose property is to correct and destroy an Acid; and therefore in these cases may rationally (besides Experience proves it) recommend *Coral, Crabs-eyes, Margarites, Chalybis limatura, &c.* *Sylv. de alim. ferm. in ventric. lesâ Prax. med. lib. 1. c. 7.*

This exorbitant Acid sent into the Intestines may (with sharp vapours excited there-
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from) cause an *Iliack Passion*, *Dysenteries*, *Cholick*, &c. But if it be conveyed to the Blood-vessels, so as to pass the stage of the *second Digestion*, it doth destroy the sweet Balsamick *Crafsis* of the Blood; and by altering its genuine texture doth give occasion to some of its Principles to become too much exalted, and as the ingenious Dr. *Willis*, de *Fermentatione & Febris* hath proved, doth produce several Diseases; but its Effects may principally be discerned in *Putrid* and *Intermittent Fevers*; The *Phænomena* of which latter *Fran, de le Boë Sylvius de febr.* ingeniously solveth from a spurious acid *succus Pancreaticus* and depraved *Bilis* making sudden Eruptions into the Intestines, and a mutual Conflict with each other, yea when absorbed by the vessels into the blood.

Not only the debilitated (as I said before) but also the over-acid and vitiated Ferment may concur to the Production of many Distempers; for it precipitating the sweet and well-poised Temperament of the Blood, giveth Fluidity to its *Compages*, and from thence an Exaltation of its sulphureous and saline Parts. This *Dyscrasia sulphureo-salina* and *salino-sulphurea* impressed on the Blood and *Genus Nervosum* giveth Being to the *Scurvy*, which sheweth it self by its vitiated Ferment in various Dresses over the whole body, such as Weariness, Dulness of Spirits, Spots, Swellings, Asthma, Change of Urine, flying Pains;

stinking Breath, Rheumatisms, Gout, &c.

Among the Distempers derived from a Pravity in the *second Digestion* may be reckoned the *Dropſie*, and not as *Sennertus*, following the footsteps of ancient Physicians, laying it upon an ill Constitution of the Liver, would have it. For on all hands it being allowed to be from a Non-separation or an Abundance of Serous Humors retained in the body, want of a due Ferment (to the destroying of which an exorbitant Acidity will in no small measure concur) as well as an Obstruction in the Vessels or *viscera*, may much contribute thereto. For when the Saline and Sulphureous particles are deficient in their due state and proportion, either by want of Aliment, or by consuming Chronical Diseases, or by a depraved Stomachical Ferment communicating it self to the Alimentary juice received into the blood, or by want of a due access of Air, or by a mixture of heterogeneous things with the Aliment; then the blood becomes too much dilute and watery. As by Obstructions in the Urinary and other Passages, so the loss of a due Ferment (as many Cases might be produced of an *Ischuria* or Suppression of Urine by a meer defect of Fermentation in order to a Secretion) to lax the Contents in the Blood-vessels, or rather to make a Secretion, the Urinous *Latex* is not separated from the blood, but regurgitates in its Vessels, until Nature overburdened

burdened layeth it down in the Habit of the body. thence an *Anasarca*; or in the *Abdomen*, and thence an *Ascites*; and if with a *flatus* in the Cavity of the lower Region, thence a *Tympanites*.

Besides the Usual causes of a Consumption of the Lungs, such as an Ill-conformation of the Breast, an Hereditary weakness in the Lungs and Inclination, precedent Diseases as *Pleuritis*, *Empyema*, *Variola*, &c. obstruction of the Lympheducts of the Lungs, unwholesome Air, and acrid Steams, a spurious Acidity impressed on the Blood and the *Genus Nervosum* hath no small share; in as much as the Corroding humor will soon exulcerate the Lungs, or at least excite the *Diathefis morbofa* of them.

Beside the exorbitant Ferment of the Kidneys (if any there be) and their lax *Compages* too much percolating the *Serum* from the Blood, this inordinate Acidity causing a too loose Contexture of Parts, and consequently too great a Secretion of Serous humors, doth much concur to the foundation of a *Diabetes*. As an *Ischury* many times doth not so much depend on the Stone or Obstruction of the Urinary vessels, but on a too strict and fast *compages* of the blood, when for want of a Saline ferment the Serous parts remain unseparated; so from too much Acidity, too great

a Secretion, and consequently a *Diabetes*.

This spurious Acidity assaulting and combining with the Tartareous recrements of our bodies, doth coagulate into Gravel or Stones commonly in the Urinary passages. For all Stony Concretions take their Original either from a viscous Matter, or fabulous Earth congealed together by a *Saline Agent*; as *Nitre*, *Alum*, *Sal Gemma*, &c. or by a *Seminal petrifying Juice*, whence many stony Concretions take their growth, as *Coral*, *Coralline Moss*, and many other Marine Concretions. Yea perhaps it might be truly asserted, that *Rock* take their growth from the Plastick power of a petrifying Seed.

If this depraved Acidity arrive with the Blood to the Brain, so as to cause Obstructions, (which are as Bars to stop a generation of fresh Animal Spirits) or to deprave its Ferment, it effecteth a *Coma*, *Lethargy*, *Carus* or *Apoplexie*, according as an acid, ferous, or otherways vitiated humor hath entered the Brain more or less, and the Spirits retire from the outward parts of the Brain, or are incapacitated for Motion. But if a putrid recremental *sordes* hath entered with, and defiled them Animal spirits that are generated, it causeth an Explosion of the *Spirits* until they have shaken off the heterogeneous Matter offending, as in an *Epilepsie*, *Convulsions*, *Swoonings*, &c.

If for a Nutritive juice to be conveyed to each part, that by its proper digestive ferment assimilateth a convenient matter to repair that which was lost, a lowr fretting Humor is advanced in its place ; instead of Nutrition many Diseases are occasioned. For the peculiar ferment of each part being hereby depraved, That matter which should be Nutritive, will become a sharp corrosive substance or humor, as in *Cancers, Fistulas, Ulcers, Aposthumations, Leprosies, Inflammations, Strumas, Scabies*, and many other maladies.

If the thus depraved Aliment reach the *Genus Nervosum*, but not so powerfully as to produce a multitude of Infirmities incident to that kind, yet sufficient to cause the *Succus nervosus* to degenerate from a volatile spirituous Ferment into an Acid humor, and by the extremities of the Nerves to be laid down in the *Synodia* of the joints and the extremities of the Organs, where the nervous fibres end, and it there meeteth with a Tartareous or fixed humor from the blood ; the Gout taketh its off-spring, or at least is excited from a latent hereditary Seed. From the combination of these different saline humors (even as from spirit of Vitriol and oyl of Tartar) cometh white hard Coagulums or Nodings ; and by the irritation of the nervous fibres a flux of Humors, and consequently *Solutio Continui* is the Result ; whence the Gout,

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attended with his various symptoms or wracking Torments, approacheth Champion-like almost irresistible. The *Gout* Enemy-like having one displayed his Colours, how easily are its forces increased by the eating of Salt-meats, drinking of Acid liquors, and *French*-Wines much abounding with a Tartareous Salt: which maketh the aforesaid Cause very probable.

It may be objected, That if a spurious Acid or depraved Fermental juice of the *first Digestion* be thus transferred from the stomach through the subsequent Digestions, as to lay a foundation of so many Distempers; then from a depraved stomachical Ferment, the Diseases resulting from the second and third Principal, and other peculiar Digestions, will all arise together, because the same depraved Alimentary juice is carried in a very small time through them all.

Ans. An Error in the first Digestion being not corrected in the second or subsequent, thence it will follow; That an Error in the stomachical Ferment will be as a Proximate or at least as a Procatartick Cause of many Diseases immediately ensuing the Digestions subsequent to the first. Yet it may not be concluded, that it always concurreth as a necessary Cause. For many times Distempers are the very Products of, and are derived from the Depravation of latter Digestions, with-
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out any previous disposition from the primary Ferment; as the Depraved ferment of Sanguification or Production of Animal Spirits may be no less hurtful to our bodies, when it is immediately derived from the Errors of subsequent Digestions, than when it is laid in the stomachical or first Ferment.

Thus the Blood wanting a vital Ferment in the Heart and Arteries, or its usual volatifying Ferment from the Air, for want of a due Secretion of its recremental *sordes*, by Obstructions of the vessels, want of Perspiration, and inordinate use of the *Sex Non-naturalia*, &c. will cause *Fevers*, *Scurvies*, or other Distempers incident to the blood, when the stomachical Ferment may be entire.

The Brain also being too lax or weakened by the irregular use of the Six *Non-naturalia*, or by the illness of them, or otherways having lost its saline volatifying Ferment, may of it self give occasion to many Distempers incident to the *Genus Nervosum*.

The Womb in the Female sex by its peculiar Ferment causeth an inturgescence of the Uterine blood-vessels, so as to open them, and make a Lunar Evacuation of the superfluous blood; which by the intention of Nature is designed for the nourishment of the *fœtus*, but if there be no Conception (excepting impediments)

diments) then a Menstrual flux. If the blood-vessels be obstructed by gross humors, or their orifices closed by Cold, &c. then the superfluous blood ready for Expulsion contracts a violent acrimony, and regurgitates with the circulating blood to the Heart and Brain, whence *Syncopes, Palpitations of the Heart, Faintings, Convulsions, Suffocation of the Lungs*, yea many other Distempers according as the Blood and the *Vital* Spirits are tainted, or the *Animal* defiled. Instances might be given of an *Epilepsie, Palsie, Tumors, Scurvy, &c.* occasioned by the stoppage of the Menstrual course, which seem to be from the enormities of the second and third Digestion; but the *febris alba* peculiar to this sex with its usual symptoms plainly illustrateth, that the Menstrual Obstruction may ill affect the second and third Digestion.

Not only in the Female, but also in the Male the Spermatick vessels, exorbitant or deficient in their Ferment, may produce direful disasters.

The Spleen by its ferment helpeth to sublime and exalt the feculent and terrestrious parts of the blood brought by the Arteries, so that by the Splenical ferment the blood returneth in the veins far more pure with its exalted Principles, and fitter to deposite the the Bile in the Liver. But when the Spleen is ill-affected, the blood either over-fermenteth

eth, as in the Scorbutick and Hypochondriacal diseases; but if obstructed or Scirrous, the blood is deprived of its due ferment, and thence may occasion a *Dropsie, Cachexie, &c.*

To these may be added the depraved ferment of each Part, all-sufficient to produce Maladies in them, yea when the foregoing Digestions are in good plight. But I shall not insist thereon, having taken a short Abridgment of most of the Distempers incident unto our bodies, which may lead me to an Enquiry after the Vertue of this *Ilmington-Spaw.*

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PART.

PART III. SEC. 3.

AFTER a short Cursory of Diseases, I come next to enquire into the Medicinal Use of this *Limington-Spaw*; and finding it to be a Chalybeat Spring, a little Scrutiny into the Nature and Artificial Preparations of *Mars* will much help to our business in hand.

Iron by a Chymical *Analysis* is found to consist of *Salt*, *Sulphur*, and *Earth*, as the three principal Constitutive Ingredients, with a small quantity of *Water* and a less of *Spirit*. I say not, that These are the first Principles, (for it like o-her Metals is derived from *Water* or a Nutritive *Succus* as a more remote, but Matter indeterminate as the real primary Element) but that They are such which do immediately make up the Body of Iron, and expose it as such an Object to our Senses.

Chalybs or *Steel* doth differ from *Iron* only by Calcination with *Horns*, *Claws*, and *Hoofs* of Animals, or with such like *Alkalis* laid *stratum super stratum*: Which by their Alkalize volatile Salts do carry away in Calcination many of the soluble parts of Iron, and destroy

destroy much of its Acidity. So that *Steel* is of a more fast and hard body, or of a closer texture of Parts than *Iron*, and doth much partake of an Alkalizate Salt.

The vertue and operation of *Mars* doth chiefly depend on its Saline and Sulphureous parts, and according as they are more or less set at liberty from the terrestrious, so a Preparation is more or less Medicinal. The usual Compositions are these: 1. *Crocus Martis aperitivus cum sulphure, cum aqua, vel aceto.* 2. *Crocus Martis astringens.* 3. *Tinctura Martis.* 4. *Extractum Martis.* 5. *Mars diaphoreticus.* 6. *Vitriolum Martis.*

1. *Crocus Martis aperitivus cum sulphure* is made by applying a Butt of *Brimstone* to a hot Bar of Iron, or by calcining the Filings of Iron with Sulphur in an earthen pot or Crucible. In either way the Acids of Sulphur do penetrate the body of *Mars*, so as in the operation to carry off much of the sulphureous parts of Iron, but by the addition of the acid parts of Sulphur to much increase the Saline. Some of the Sulphureous do yet remain, is apparent by the fetid savour in Belchings after the taking of this *Crocus*. That the Saline part is increased, is clear; because the Weight of the Iron will be increased by the Preparation. For Sixteen ounces of good Iron, by weighing after the Operation is ended,

ended, will yield Eighteen or Nineteen (except the Calcination be vehement, which is needless) of *Crocus*.

This is an excellent Preparation, and worketh good effects upon a twofold account, viz. 1. because of its *Sulphur*, 2. its *Salt*. The *Sulphur* will enrich and add a new supply to a cold watery blood, so that in the *Febris alba*, *Pica*, and *Leucophlegmatia*, it will reduce the pale-faced Patient to a florid complexion; because of its *Salt* it is a good Depopillative, as in Uterine obstructions and those maladies peculiar to the Female sex, and in the *Dropsie* may be of good use because of its vitriolick Stipticity, that bindeth up the laxity of vessels and other parts.

In the making of *Crocus Martis cum aceto*, the Sulphureous parts are almost separated, insomuch that after it is swallowed down it yieldeth but a weak sulphureous savour. But by addition of the Acid parts of Vinegar, the Saline Principle of *Mars* is so much exalted and advanced so near an Acid; that by instillation of other Acids it will scarce make any effervescence or ebullition at all, yea weaker than *Crocus cum Sulphure*, that maketh a far less ebullition with *Acids* than plain filings of *Iron*.

This *Crocus* in the Preparation having lost much of its Sulphur, is unfit for use when the blood is too low, or depauperated in its Balsamick

samick Sulphur ; as in diseases proceeding from a waterish blood, or from phlegmatick Obstructions. But where the blood is retorrid or adust, this *Crocus cum Aceto* by its Saline Principle being cool and aperient is of good use, as in *Hypochondriacal* distempers, *Carbuncled* faces, and to astringe a laxed blood-vessel, because of the saline stiptick Principle implexed in the Terrestrious.

Crocus Martis cum Aqua is made by exposing *Plates* or *Filings* of Iron to the *Rain* or *Dew*, until it hath contracted a Rust, which collected is called *Crocus Martis cum Aqua*, or *ferri Rubigo*. This *Crocus* consisteth of the sulphureous, saline, and terrestrious parts combined together ; yea indeed it is the very substance of Iron, having its pores much opened by the Dissolvent or Saline parts of *Water* ; which not only maketh its Pores more open, but by combining with it maketh this *Crocus* an excellent Aperient medicine, whose Deop-pilative vertue chiefly dependeth on this Salt.

The Sulphur of Iron being retained in this Preparation renders it a fit ferment for blood, whose active Principles are weak and faint : And the Saline part (being exalted by That of the Dissolvent *Water* that much laxeth the body of *Mars*) renders it a good Aperient in Obstructions, as of the Liver, Spleen, Mesentery, Lacteal vessel, or Womb with its coherent parts.

Crude

Crude *filings of Iron* taken inwardly may be dissolved by the Acid stomachical Ferment, as by extraneous Acid Menstruums, which may be concluded from the fetid strong scented Smell, and the blackness of their Excrements that take it unprepared. But then it must be a strong robust Constitution, able to bear the Iron in its solid substance; but in Constitutions where the acid stomachical ferment is weak, there is danger, lest that the *Filings* should remain undissolved and cause Obstructions, or else grating on the Tunicles of the Intestines cause wracking Torments. Besides, the Sulphureous part of *filings of Iron* unprepared will more increase the Ferment of the Blood than the Saline stiptick can repress; which maketh it unfit for Use in hot Constitutions, or in Distempers proceeding from a wracking fiery Blood. And if the *Filings of Iron* be of so hard a Dissolution, much more these of *Steel* whose substance is more fast and compact, and pores more closed, that its Dissolution must be more difficult.

2. *Crocus Martis astringens* is made by calcining of *Filings* or *Plates of Iron* in a strong fire, which carrieth away the saline and sulphureous parts that made it an Aperient medicine. Some wash the Iron, in order to the Preparation, with fair Water or Vinegar; which not only with frequent Washings may carry away much of the drossy impurities, but

but also take away or at least destroy much of its volatile Salt and soluble Parts, that must afterwards by the violence of fire have been consumed or else disposed for a separation. The terrestrious part of the Iron being deprived of the active Principles (for by a strong Calcination those few that remain are become fixed) it imbibeth the saline igneous Particles, which remain fixed therein. And being much deprived of its Salt that renders it a Deoppilative, it is become a proper Astringent to be used in a *Diarrhæa*, *Breaking of a vein*, *Flux of Hemorrhoids*, *immoderate Lunar evacuation in women*, &c. for besides the Astringency it is endowed with, it will imbibe much of the exorbitant Acidity of our bodies, seeing it is deprived much of its Saline principle.

3. *Tinctura Martis*, made with *Rust* or *File-ings* of Iron and white *Tartar* boiled together in fair water, is an excellent Aperitive: for besides the dissolved *Mars*, the *Tartar* is also a great Assistant, especially in diseases proceeding from an acid Humor. Whence it may be of good effect in a *Cachexie*, *Dropsie*, *Uterine obstruction*, and *Hypochondriacal Distempers*.

4. *Extractum Martis* made with the phlegm of Honey, juice of the White-wine Grapes thoroughly brought to maturity, and the juice of Lemons, hath its aperient faculty not only from

from the Iron, but also from the saline part of the Menstruum. Now this Menstruum being not very corrosive, doth dissolve only the saline and soluble parts of *Mars*, but leaveth the gross and terrestrious parts behind. So that the saline parts of Iron impregnated with the Essential salts of the Menstruum, maketh it a good Opener of Obstructions, such as those of the Liver, Spleen, Mesentery, or of the other *viscera* of the *Abdomen*.

5. *Mars Diaphoreticus* made from *Rust of Iron* and *Salt Armoniack* sublimed together into Flowers, which being dissolved in water will with oyl of *Tartar* or spirit of *Salt Armoniack* be precipitated in form of a Powder called *Mars Diaphoreticus*; which taketh its Sudorifick quality from the volatile penetrating parts of *Salt Armoniack*, carried with and fixed in the Chalybeat particles in Sublimation. These volatile Salts will soon open the Pores of our bodies, especially seeing they carry with them Chalybeat Particles all-sufficient to cut tough viscid humors obstructing the Pores or Passages.

6. *Vitriolum* or *Sal Martis* is made from the parts of Iron dissolved in an Acid Menstruum, such as oyl of *Vitriol*, oyl of *Sulphur*, *Aqua fortis*, &c. but most commonly with oyl or spirit of *Vitriol*, which giveth the Denomination to the Composition: yet if we
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look into the nature of the thing, we may form a like Composition of other Acids, with oyl of Sulphur, spirit of Nitre, &c. as well as with oyl or spirit of Vitriol, only changing the name into *Mars sulphuratus* or *Sal Martis cum Sulphure, cum Nitro*, &c. In the making of *Sal Martis* with oyl of Vitriol, and Iron either filed or in its gross substance, some Chymists will add an equal weight of spirit of Wine to the oyl of Vitriol, or else two pounds of ordinary Water to one pound of good spirit of Vitriol. The reason of it is, because the spirit of Wine by its Alkalizate Salt, or else the Water may dilute and weaken the oyl or spirit of vitriol, that it may not incorporate with the main body of *Mars*, but with the saline and more soluble parts; that there may be gained a more pure Salt, freed from most of the sulphureous and terrestrious parts of Iron. In the Dissolution the saline parts of the Menstruum do joyn with these of *Mars*, and in the mutual conflict of Fermentation they take off and dull the edges of each other, and by combining together become a Neutral Salt.

In this Preparation the sulphureous and terrestrious parts of Iron are separated from the saline, from which dissolved in fair water by Evaporation, ChrySTALLIZATION, &c. is made *Sal Chalybis* or *vitriolum Martis*.

Sal Chalybis being actuated by the Vitriol

is of a stronger operation against Obstructions than *Crocus Martis*; but for want of the sulphureous principle of *Mars* will not add so strong a Ferment to the blood, and consequently is not so effectual in *Cachexies*, nor against Diseases proceeding from a cold watery constitution. But where the blood is over-fermented, where it is either Pontick, acrious, or fiery, and in Obstructions proceeding from such a Dyscrasie of the Blood it may be of excellent use.

This *Ilmington water* (as I have proved before doth derive its vertue from an Esurine Salt preying upon a *Minera* of Iron, which by working upon and combining with each other do become a *vitriolum Martis*. I shall then in the next place shew more fully as to particulars, wherein this Spring may be serviceable to our Country in respect of its Medicinal vertue, and then lay down some *Cautions* and *Rules* to be observed by the Drinkers of this Chalybeat Water.

After a short Account in the foregoing Section of Diseases, how they may be derived from the Depraved digestions of our body; I shall now consider, how far this *Ilmington Spring* will conduce to the Restoration of the *lost* or *vitiated* Ferments, and consequently be a Preservative for *Health*, or restore that which is impaired.

First

First, the *Scurvy*, being caused by a *Dyscrasie* of the blood, either when its saline or sulphureous parts are too predominant, may be much corrected or curbed by this Chalybeat Spring: In as much as the Mineral Salt is herein become near a plain *Alkali*, and will penetrate to the *second Digestion*, is able to correct the sour saltish Blood. And being freed from the sulphureous parts of Iron, will much correct the sulphurco-saline *Dyscrasie*, when the blood like Wine is become over-fermented or fretted. This *Spring* being a great *Diuretick*, will help to carry off that which is superfluous, and being a good *Aperient* in obstructions of the Spleen may correct its vitiated acid Ferment, that with other *Enormities* may concur to alter the sweet balsamick temper of the Blood.

But considering that a Crude Digestion or spurious Acid Ferment of the Stomach doth many times as a Procatartick Cause lay a foundation of the Scorbutick Ferment; this Water must be assisted with Purgatives to carry off the recremental *Sordes* of the Stomach, and other Digestions, (more especially for Cautions hereafter laid down,) and be also assisted with some peculiar Medicine to restore the blood to its sweet and well-poised Temperament, according to the Cause from whence the *Dyscrasie* took its Original: which requireth the Advice of a skillful Physician.

Secondly

Secondly, the Spleen by a Specifick Ferment conduceth to a Secretion of *Bilis*, but if by Obstruction or Depravation it be deficient in its fermental Operation, the blood not purged from its *sordes* doth become obscure and muddy, so that the Animal Spirits thence elaborated are neither pure nor refined, but dark and gloomy fit for melancholy Phanisies. From a long supply of such feculent blood are the Spirits spoiled, and Hypochondriacal Fitts and Melancholy take their growth.

This *Spaw-water*, containing a *vitriolum Martis*, is a good Deoppilative in Splenical obstructions, for being of a penetrating nature is good for these abstruse Recesses. By the Reaction and Combination of the acid salt of the Menstruum with the Alkalizate of *Mars* is made a *Neutral Salt*, but most inclining to an Alkali, Whence it may be of good use to correct the spurious acid Ferment of the Spleen but now communicated to the blood.

By restoring the Spleen to his natural Ferment in destroying that spurious Acidity, by opening Obstructions, and its Diuretick property carrying off many of the feculent parts, the blood may be freed from the opaque Melancholy steams that defile the Brain, the workhouse of Imagination and Judgment, and so be restored to its natural *Crafsis*. But withal observe, That this Water must be helped with

with Purgatives to cleanse the blood from its *faces*, lest that instead of being an Aperient it should prove to be an Obstrueter, especially in the Extremities of the small Capillary vessels, where the Blood in its Circulation is hindred by a viscous dreggy Matter ; but besides Catharticks, where other Digestions are deficient in their office, *Specificks* must also be applied.

Thirdly, the *Dropfie* consisteth in a dilute watery blood, or rather in a Non-separation of *Serum* or Urinous *Latex* that regurgitateth into the blood-vessels, until it be laid down in the Habit of the body, and sometimes with a *flatus*. The loss of secretion of this *Latex* is frequently from the want of a Ferment in the blood, which chiefly dependeth on the Saline Principle as the main cause of laxing the *Compages* of the blood for the separation of Serous Humors. Besides the loss of a Ferment, Obstructions in the Urinous vessels and Lympheducts many times do lay a foundation to the structure of a *Dropfie*.

Ilmington-Spaw may be useful in this case upon a threefold Account. 1. Although *sal Chalybis* be freed from the sulphureous parts of that Mineral, and consequently is not (as I said before) proper by it self in *Cachexies* and cold Phlegmatick Distempers ; yet it doth mightily take off the spurious Acidity and laxeth

laxeth the too strict *compages* of the blood. And this Salt coming nigh to an Alkali is a great Diuretick, fit to carry off the superabundant Matter. 2. The saline Particles with their Edges will cut the viscous Matter obstructing the vessels, which many times put a stop to the *Latex* in its proper Passages. 3. It being a Stiptick Medicine may be beneficial to restore the debilitated Membranous parts too much lax'd by the stagnating water. All which Properties do exactly correspond with the Indications of Cure of the *Drop-sie*. Yet we must necessarily allow *Specificks* and other Medicines *intermixtim* applied, according as the Patient is this or the other way inclined.

But withal take notice, That what is here spoken must be understood of a *Drop-sie* in its first growth; for otherwise the gulping down of three or four Quarts of Water will help to swell up the debilitated parts, and add a great Oppression to decaying Nature.

Fourthly, from *Gravel-stones* in the Reins and Bladder, and also the *Strangury* and *Dys-ury* we may be relieved by drinking of this *Spaw-water*, in as much as it will destroy that exorbitant Acid combining with the Tartareous recrements into *Gravel-stones* in the Urinary Passage, and also as a Subalkalitate take off that acrimonious Humor which causeth a sharp fretting Urine. Besides taking off
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that sharp Humor, that giveth increase to these stony Concretions and fretting Urine, it being drank in a large quantity, and a great Diuretick, it will keep the Current open and lax the Urinary vessels, so as to carry off much of the feculent Matter, and like a Brook with a Current-stream take with it some sandy Concretions, which in our Bodies we call Slipping of a Stone.

Whether or not a *Calculus* may be dissolved whilst in the Kidneys or Bladder, is not to my purpose here to enquire; for I look upon it to be beyond the vertue not only of This, but of all other Chalybeat Waters.

Fifthly, the *Jaundice* proceeding not only from an Obstruction of the Hepatick vessels by tough viscous Humors, Scirrous Tumors, &c. but also by the Saline and Sulphureous or Bilious parts of the blood, too much exalted and indisposed for a Separation, but dispersed over the whole body. As it happeneth frequently after immoderate drinking of Wine or strong Liquors, that too highly ferment the Blood; so that the acrious particles remain unseparated, and shew themselves by a yellow Tincture of the skin.

For the Cure of the *Jaundice* we may have recourse to this *Spaw*, and that upon account of answering these two Indications. 1. It opens Obstructions derived from impediments in the second Digestion, and so may reduce

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the Choledochal vessels to their proper functions. 2. The *Vitriolum Martis* in this Water by its Stiptick Vitriolick Salt will take off these high flown acrious Particles that make too strong a Ferment, and whirl about these adust Cholerick parts, which by a due ferment and lax *compages* of the blood should have been thence separated.

Sixthly, the Lunar Evacuation of Blood in the female Sex is checked in its natural course by Obstructions in the Uterine Sanguinary vessels by viscous tough Humors, Tumors, or when their Orifices are closed by Cold, &c. The blood stopped in this Critical Evacuation doth regurgitate by the veins up again into the body; from whence follows a Depravation of the vital Ferment, and thence frequently a Crudity of Humors causing the *Green-sickness*, *Cachexie*, &c. And if by stagnating in the vessels the blood hath acquired a virulent acrimony, so as to oppress the vital Spirits, then *Syncopes*, *Faintings*, &c. but if it reach the Animal Spirits, then *Epilepsies*, *Hysterical Fits*, and such like Diseases will make their Assault.

In Diseases thus proceeding (for these Distempers may also otherways take their Rise, as from passions of the Mind Hysterical Fitts, from loss or defilements of the Spirits *Lipothymia*, *Syncope*, &c.) *Ilmington-Spaw* is of excellent Use. For it will open Obstructions,
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sterge the excremental *sordes*, and take off the spurious Acidity that is many times exorbitant in the blood, and may adhere to the Orifices of the Uterine vessels, that often causeth the *Febris alba* to be of so difficult Cure in some young women. *Sal Chalybis* being freed from the sulphureous part of Iron, it will not be amiss to add some *Crocus Martis* or other prepared Medicine, that by its sulphureous Particles may increase the Sanguinary Ferment in *Cachexie*, *Green sickness*, &c. by which the Cure will be facilitated, and the pale-faced Patient brought to a lively Complexion.

But if there is a virulent Acrimony contracted, then a more Appropriate medicine is also requisite; for this *Spaw* will not reach the remote recesses of the *Genus Nervosum*. So that Specificks of a penetrating nature and abilities to correct the Enormities of the Digestions subsequent to the Stomachical, with Catharticks to purge off the *feces* and dregs of our Bodies, must necessarily be required.

Seventhly, this *Spaw-water* drank will help to cleanse and purifie the Blood, and may be used with good success in Distempers proceeding from a saline acridous Humor, or from Obstructions in the *second Digestion*. But neither Chalybeats nor Spaw-waters will help the Disasters of the Animal Spirits suffering in their abstruse Passages. It may as a *Subalkalitate* correct a spurious Acidity in the blood.

and by opening the obstructed vessels as a Diuretick carry off much of the recremental *for-des* of the blood, and so as a Remote Cause help to prevent Diseases proceeding from exorbitant saline Humors, such as the *Gout*; but cannot reduce the coagulated Salts from the *Synodia* of the Joynts, nor correct the spurious Acidity that hath reached the *Genus Nervosum*, when the *Gout* attended with direful Symptoms doth appear.

Neither can this Chalybeat water reach the Morbifick Disposition or Seminal *Idea* of the *Gout* (more especially in persons to whom it is Hereditary) which only wanteth an Acid ferment to bring this latent Enemy upon the open Stage. This latent Seed will shew it self in growth as often as it is excited by Saline Agents, such as Salt-beef, Stale beer, French Wines, &c. Which morbid *Idea* first laid by the *Archeus*, is beyond the Power of any Spaw-water or Chalybeat, but requireth more noble Balsamick *Arcana*.

I shall now sum up the Vertue of this Spaw-water, as *Van Helmont de aq. Spad. Parad. quint.* doth of the German Spaws, *Pawhont* and *Savenir*, and of all such that take their Medicinal vertue from an Esurine Salt, and a dissolved *Minera* of Iron.

This Spaw assisted with Catharticks will help their Stomachs that are loaded with a
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mucous Matter, and free us from a viscous filth that hath entered the more secret Recesses of the veins and *viscera*; but the more difficult, the more remote from the mouth. It may be used with good success in obstructions of the *Liver*, *Spleen*, *Reins*, and *viscera* of the middle and lower Region, and Diseases thence depending, and may be of excellent Use to correct the Scorbutick dyscrasie of the blood, and all Distempers proceeding from an exorbitant Acid, and Tartareous Humor, by obstructions perverting the Temper of the blood.

Van Helmont (in the place before cited) determineth the *Spaw-waters* in the Sphere of their Activity. *Potestas Aquarum non transtendat Hypochondrium. Non enim supra Renes, ad Cor videlicet, Pulmonem, aut Cerebrum Aqua attingunt: quocirca etiam affectibus illis ex idiopathia genuinis nisi per accidens succurrunt Spadane.* And a little after, *nec Pota Spadane in Epidemicis, Endemicis, & Astralibus morbis, ut sunt Pestis, Pleuritis, Prunella, &c. neque conferunt plurimum quibus venenum subest, vel assumptum vel intus genitum vel contagio participatum, neque in morbis Tinctura, quales sunt Lepra, Lues Veneris, Morphea, Cancer, Epilepsia, &c.* But for my part, I cannot adhere to his Opinion, *viz.* That we must not expect Cure of Diseases that proceed from a higher Rank than the viscera of the Abdomen: For it must needs be granted, that *Diureticks* enter the Blood-vessels,

vessels, and the blood in its Circulation doth pass through the Heart, yea like a Torrent washeth all parts of the Body. Yea we are not sure of any vessels to convey this Water drank or serous Humors from the Stomach or Interstices immediately to the Kidneys, but before it can enter the blood-vessels must be conveyed above the *Hypochondrium*, and by the Circulating blood may be hurried to all parts of the body, until by Transpiration, Sweat, or Urine it is separated: and whilst mixed with the Blood may by its Active principles of Salt and Sulphur working upon the blood alter its depraved *Crafsis*, and restore it to a well-poised Temperament. But though it may with the blood be carried to the remote Parts from the Heart, yet thence it will not follow, that this Spaw-water is able to reach and cure the Maladies of the *Brain* and *Genus Nervosum*. For besides the Contrariety of its Saline Principle to that of the Brain, a Watery blood is an unfit Subject for the elaborating of Animal spirits. When instead of pure Blood a deluge of Water is supplied by the Arteries, the Brain seemeth as it were overwhelmed, and Nature to suffer: as may be concluded from the frequent observation of Water-drinkers, that after large quantities taken do feel a dulness and heaviness of Head, stupidity, and other infirmities incident to the Brain, and its *Appendices* the Nerves, according to the previous inclination of the

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Patient, either towards a *Palsie*, *Lethargy*, *Apoplexie*, &c, But this happeneth usually when the *Water-drinkers* proceed headlong, without preparing their Bodies, or being regular in their Water-course, or taking Purges to carry off the Water lodged long in the blood, and the *feces* that may cause Obstructions, or considering their Habit of Body and Inclination. Upon which accounts they may as soon drink for their Ruine as for the restoration of Health. Which may be spoken by way of Caution, but more of This in the next Section.

Instances might be produced of several Persons, that by drinking Chalybeat Waters have found relief from an *Asthma*, *Epilepsie*, *Palsie*, and many Distempers derived from a Pravity of the Brain and Nerves. But then as *Helmont* rightly adviceth, we must distinguish Diseases and their Cure by their true Causes. For Example, upon obstruction of the *Menses* in women there may ensue an *Epilepsie*, *Asthma*, or *Palsie*, and the *Spaw water* by provoking the Menstrual Course may free the Patient: yet we must not recommend the *Spaw-water* as a usual Specifick to cure the *Epilepsy*, *Apoplexie*, *Asthma*, or *Palsy*; for what is done as a Procatartick Cause, and upon a secondary Consequence cannot be a Specifick, nor answer the Primary Intentions of Cure. Accordingly then must we steer our course, and

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act with respect to the true Cause. For these Distempers proceeding from an ill-affected Uterus, are far different from these that are common to both Sexes.

Whatever *Helmont's* Spaws might be (which, saith he, took their vertue from an Esurine Acid and a dissolved *Minera* of Iron) as to Use in *morbis Tinctura*, under which he comprehendeth the Leprosy, Morphy, &c. I shall not take upon me to determine: but yet do see no reason why this at *Ilmington* may not be beneficial in a Leprosy, that proceedeth from an acrious corroding Humor, especially when applied in external Washings.

Of what excellent Use are Vitriolick Waters for the cure of old running sores Chirurgical Practice may testifie, and many already by the washing at this Spring. To which agreeth the Testimony of *Agricola* speaking of Atramentous Waters, (which are such that tinge with Galls,) *Aque atramentosa sive ipsum Atramentum sutorium combiberunt, sive Misfy, sive Chalcitida, sive Sory, sive Melanteriam, easdem vires habent quas Aluminosa, multo tamen efficaciores, quòd multa acrimonia cum astringendi vi sit conjuncta. Quà de re etiam prosunt Ulceribus, quæ pascendo serpunt. Agric. de natur. eor. quæ Efflu. ex ter. lib. 2.* So that he concludeth all Vitriolick waters more excellent as to the Cure of corroding Ulcers and other Distempers than Aluminous; whose
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vertues he reckoneth to cure the ulcer of the Bladder, to help a weak Stomach subject to vomiting, to cure the inordinate Courses in Women, Abortions, Ulcers of the Mouth, swelling of the Gums, weakness of the Nerves, (by washings I suppose,) effusions of Blood, and immoderate Sweatings.

V

PART.

PART III. SEC. 4.

I Shall now proceed to propose a method to be observed by the Drinkers of this Spaw-water ; which I shall do, *First*, by way of Caution, shewing some ill Consequences to the rash undertaking a Water-course ; *Secondly*, by laying down some Rules how to prevent these inconveniences, and to drink the Water with good Effect,

I might refer the Reader to *Van Helmont Parad. sext. de Aq. Spad.* and many other Eminent Authors, that have given good Directions for the right Use of Chalybeat Waters. But this *Section* is chiefly designed for the Poor Countrymen, who most commonly are incapacitated to apply themselves to such Authors : yet were their Abilities so great, different Springs do require different Directions ; especially this *Spaw*, that is so highly impregnated with a Mineral. Besides, I observed many poor People resort to the *Spring*, that could not require the Advice, much more the Attendance of a Physician except upon meer Charity ; yet they boldly undertook the drinking of a large quantity of
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this Spaw-water, without preparing their Bodies, yea for any Distemper; neither with Advice nor Physick, but proceeded with their own confidence, or rather Ignorance, and might as well have drank for the Destruction as Preservation and recovery of their Health. For upon rash Undertakings in this kind, these Ill consequences may ensue.

First, this Spaw-water containing in it a great quantity of *Ocre* or *Terra Metallica*, (for out of a Quart of this Spring-water I have got the best part of a Spoonful of an Earthy sediment) which being drank with the Water, although as I have proved by the Experiments on the Spaw, it is not a simple Earth, but containeth much of the Salt of the *Minera* and of the *Menstruum*, may endanger the Drinkers with Obstructions in the Capillary blood-vessels, or in the Lacteals conveying it from the Intestines to the Blood. And what may be the Result from Obstructions perverting the right use of the Spleen, Liver, or other *viscera* of the middle and lower Region, I have above *Par. 3. sec. 2. & 3.* sufficiently hinted. But if the *Sediment* enter not the Lacteal vessels, it must needs load the Intestines of these (it being not Purgative) that drink it without Physick or Advice.

Secondly, Too frequent drinking of this Spaw and also of other Mineral waters in a large

large quantity, and especially when not taken *gradatim*, will relax the fibres of the Stomach, extend the vessels and other membranous parts, upon the Relaxation of the Stomachical fibres a loss of Appetite will ensue; and upon the Extension of the blood-vessels, Lympheducts and Membranous parts, will follow *Weariness, Difficulty of Breathing*, and Increase of a *Dropſie* in them that are far gone, besides other Distempers according to the Inclination and Habit of the body.

Thirdly, This Water like most other Vi-
tricolick will cause a *Vertigo* or light giddiness in the Head, especially in them that unprepared drink it to the quantity of three or four Quarts at the first onset. Not only a *Vertigo* but also a *Lethargie, Apoplexie*, or other Cephalick Distempers, caused by an oppression of the Brain and stoppage of the Animal spirits, may ensue the taking of a large quantity, when neither *faces* nor the restagnating water are carried off.

I shall therefore propose this Method to the Drinkers of this *Spaw water*, for the avoiding of these Enormities; yet shall not be Dogmatical, but leave the Physician to direct his Patient according to the Indication of the Distemper, and thereby directing his judgment. And

First, Purge off the Recremental *sordes* of
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the Stomach and Intestines ; but rather (if the habit of body and strength will bear it) begin with a Vomit: Such as a Dose of *Sal Vitrioli*; the Quantity is usual from One scruple to Four, but may be increased or diminished according to the condition of the Patient. This Medicine I propose, because it usually worketh both by Vomit and Siege; and not only cleanseth the *viscera* of the *Abdomen*, but also by its *Stipticity* will notably fortifie the membranous fibres of the Stomach against Relaxation, that often ensueth upon drinking large Draughts of Water, and also it will help to reduce the fibres to their proper state when too much extended, and consequently are weak and unfit to embrace the Aliment taken in at the mouth. The fibres of the Stomach and Intestines being well fortified will the better contain a large quantity of Water without Relaxation, and by the Peristaltick motion of the Guts the Lacteal vessels will sooner imbibe the Water when their Orifices are scoured and like the little holes in a cleansed Strainer. Yet other Catharticks according to the particular case of the Patient may be requisite.

Secondly, Then begin to drink of the Spaw-water. They of an ordinary Constitution may begin with a Pint, but they of a stronger with a Quart or three Pints, and so increase each morning a Pint until they come *gradatim*

unto four Quarts, which may be the measure for a strong Constitution ; and as some few may exceed, so many may fall short of it. Thus may they continue in their Water-course for a Month, and cease *gradatim* as they increased at first, lest there should be left a distention of the fibres and membranes.

But withal observe, That the Water must not be drank to its full Dose at once, but rather with walking up the Hill, or moderate Exercise after every full Draught ; that it may have time to searse through the Drinkers body, especially until it begineth to shew it self by its Diuretick faculty. For the sudden drinking of a large quantity will cause a distention of the Stomach, with cruel *Tormina* or Gripes in the bowels.

Thirldly, In case the Water lieth long and heavy on the Stomach and Intestines, and at last worketh off in a Diarrhe or looseness, it signifieth the body to be unprepared, and probably Obstructions in the Mesentery or *viscera*: which requireth a Preparation by some Depilative Pills or Medicine, with convenient Solutives to carry off the feculent Matter. But in these cases I cannot lay down any one Prescription general serving for particular Persons, that according to their Distempers must have different Directions from their Physicians.

Fourthly,

Fourthly, Because of the great quantity of Ocre or Vitriolick Earth contained in this Spring water, let the Drinkers hereof observe to take at least twice a week a Dose of Physick to carry off the filth of the water, free the Stomach and Intestines from incrustation of the Earthy sediment, and the vessels from Obstructions. But the Water-drinkers must forbear the *Spaw* on the days he designeth for Purgation; except he take such a small quantity of Pills &c. on the over-night, or very early in the morning, only to keep his body from being Costive. For which purpose *Van Helmont* recommendeth a Dose of *Ruffy Pills* (the Dose may be from a Scruple to a Drachm) taken three days together in the morning before drinking of the waters. This he adviseth for the *German-Spaw*, *Pauhont* and *Savenir*, whose Mineral Ingredients are like this at *Ilmington*, though not so highly impregnated as this new found *Spaw*. *Ruffy Pills* may be of good use to purge off the filth of the *viscera*, and also the sediment of the Water, and being gentle in operation may be taken on the over-night, or in the morning designed for drinking the Water. But according to the Observations of Physicians, undoubtedly the best method will be, to compose Pills (or Physick in such form that the Patient shall like best) of Deoppilating Ingredients and Antiscorbutick, or with such Specificks that may answer the Indication of the

- Patients Distemper, but yet with such purgative Ingredients that may make the body soluble to the number of three or four Stools, and may be taken through the Water course,

Fifthly, For a more speedy passage of this Water through the body, let the Drinkers take a Glas or two of good White or Rhenish Wine, about an hour or something longer time after the full Dose of Water is drank. This is convenient, but especially for them, upon whose Stomachs and *viscera* the water lieth long and heavy; and if the water lieth still lodged in the vessels and habit of body, Catharticks and Diureticks may be helpful.

As the waters drank in a regular course will increase (but especially for a time) the Appetite after meat, or Hunger; so an irregularity in Diet in a Water-course will not only take off the Appetite, but may also lay a foundation of many Distempers, yea may produce more Evils than the Water is able to correct. Wherefore I shall propose some Observables about Diet.

First, Fast at least two or three hours after drinking the Waters, that they may have time to pass off but by eating too soon may hinder the Digestive Ferments in their Operation, or mix with the Chyle and so be carried into the Habit of the body, and leave much

much of the feculent *Jordes* in the remote parts, that may endanger the Drinker with a Fever Dropsie, Scurvy, or Obstructions very difficult of Cure.

Secondly, Take that Advice of *Helmont de Aq Spad. Parad. 6. sect. 5. Spadanas bibenti consulo, ut sobrietati consulat, edatque parcè instar Accollarum.* And a little after, *Eâ solâ Diata normâ Aqua permeabunt tutò, celeriter, ac jucundè. sec. 7.* Whereby Moderation in Eating and Drinking is recommended, lest ~~that~~ by over-glutting the stomachical and subsequent Digestions should be over-powered and unfit to perform their proper functions, which of necessity must cause future Enormities. For in most cases over-charging Nature will pluck down Health faster, than the Physitian is able to repair.

Thirdly, Meat well ordered and of an easie digestion, must be observed in all these Courses of Physick. For well known it is, that Salt meats and Seamens fare will alter the sweet Temper of the Blood into a saline scorbutick Ferment; which, if continually supplied, will be able to withstand the Operation of a *Vitriolum Martis*.

Fourthly, The Drink is to be of a middle sort; not too small and thin to depauperate and dilute the blood, nor too strong to over-

ferment it ; not too stale and sharp to produce an Exotick Acidity, nor too muddy to fill the vessels with a *faeces* ; but rather clear mellow Ale, and now and then a Glass or two of good Wine, that will be a convenient Vehicle for the dry Aliments, and fit to renew the sweet Balsamick temper of the Blood.

Last of all I shall advise the Drinkers hereof to use such Specificks in their Water-course, as shall be peculiar to their Distempers ; besides Solutive Pills to carry off the *sordes*, that the depraved Ferments of the body may be amended. For so long as the *Diet* is good, and regularly taken, and the Ferments of our Bodies are entire, Health will remain safe and sound.

FINIS.

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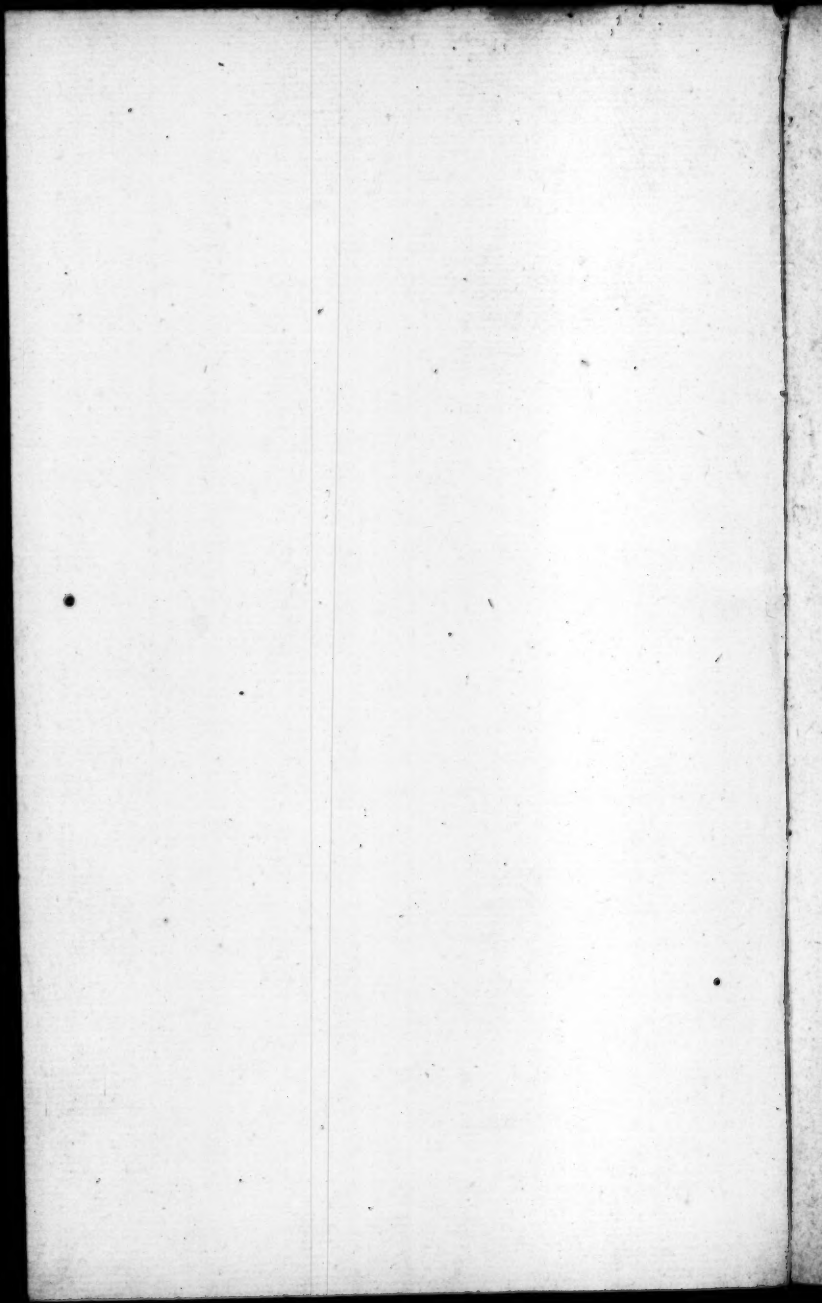
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HYDROLOGIA PHILOSOPHICA
OR,
An ACCOUNT of
ILMINGTON
WATERS

In *Warwick-shire*;

With Directions for the Drink-
ing of the same.

Together with some Experimental Observations
touching the Original of Compound Bodies.

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OXFORD,

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sity, for *John Howell* Bookseller. 1685.

But suppose that the first blood should be formed before the *Punctum Saliens*, and the Heart contribute nothing thereto. Yet it must be granted that Things proceed otherways in Adult Animals, then they do at the first formation. As for Instance; There is Motion before the Brain or Nerves are formed, yet none now deny that Office to the Brain of elaborating the Animal Spirits that serve for Motion. The *Embryo* is nourished and encreased before the Stomach and other parts serving for Concoction are made; yet after they are made in a perfect *Fœtus* and in adult Persons, none except through a Spirit of Contradiction will deny them to serve for Concoction; so that the Heart by his Acrimonious Spirit implanted therein may serve for *Sanguification*, which I imagine to be as thus.

So soon as the Chyle is mixed with the Blood, the Vital Spirit and other active Principles do work upon the Chyle to assimilate it to its own nature. By the Stomachical Ferment the Salt, Sulphur, and Spirit of the Chyle are almost set at liberty from the grosser parts of the Aliment; so that the Active Principles of the Blood soon add to their Exaltation. When the Chyle with the Venal blood is entered the right ventricle of the Heart, the Heart addeth a new Ferment thereto, and sendeth it into the Lungs, where it reciveth a farther Alteration from the Nitrous Particles
of

of the Air admitted by Inspiration, and intimately there mixed with its *Compages*, where the blood also receiveth from the Air its florid Colour : As may be seen by several Experiments of Dr *Lower's*, and also by exposing Venal blood to the open Air, for the superficial part next the air will be of a florid Red, but the under part of a Blackish colour. Let the blackish part be turned to the air, and its *superficies* will be of a light red. In the left ventricle of the heart it receiveth a more perfect mixture, and entereth the *Aorta* under the form of Blood, and is of a Scarlet colour, until the air is transpired through the pores of the skin. But Chyle is not perfectly and exactly assimilated to the blood, until it hath run through many Circulations.

The most subtile and acrimonious part of the vivifick spirit planted in the heart from its original giveth its Ferment, by which the humors receive an Effervescence and Dilatation (if capable thereof) and more or less as they are inclinable thereto. Even as Gunpowder that of it self hath no heat, but by fire doth soon dilate and hath a great effervescence : So doth the blood by the ferment of the heart, and by the dilatation of the blood the sides of the ventricles of the heart are molested, and the fibres of the heart are irritated and provoked to expel the oppressing blood. After the expulsion the Heart remains in its
Dia-

Diastole, until by a supply of fresh blood there is a new Dilatation and then a *Systole*. But to a *Systole*, besides the vivifick Spirit inherent in the Heart, the Animal spirits as in other Muscular motion are called in to help, supposing a free passage; for else what meaneth so many Nerves derived to the Heart.

The Hearts of Puppies, Frogs, &c. cut from their bodies, and the ventricles emptied from blood, will keep (as long as natural warmth) their Pulsation. Because the vivifick acrimonious spirit placed in the Heart, by heat is set on work to ferment and dilate the blood contained in the Pores and Interstices of the fleshy substance of the Heart, and by irritation of the fibres is made a *Systole* and then a *Diastole* until the blood contained in the Pores do suffer a new Dilatation; to which both vital and Animal spirits as yet unspent, that will make a tremulous motion for some time after the death of an Animal, do concur.

The Third principal Fermental *Digestion* is That of the Brain, which is well appointed with blood-vessels, that serve as Channels to convey Matter to every part of the *Cerebrum* and *Cerebellum*. Nature hath so provided for a supply of Matter, That as Dr. Willis hath observed, *Non modò arterias cum venis; verùm quod rariss & ferè singulare est, arterias cum arteriis; nempe arterias Carotides unius lateris plu-*

pluribus in locis uniuntur cum carotidibus alterius; insuper vertebrales utriusque lateris interfese & in posteriores carotidum ramos prius unitos inosculantur. Anat. Cereb. c. 7. From the blood thus conveyed by the Carotidal and Vertebral arteries, the purer and more subtile Spirituous part is carried into the Brain by the winding Meanders of the Arteries, whilst the Grosser part is absorbed and carried back by the Veins, and the *Serum* imbibed by the Glandules and Lympheducts, in order to be restored to a fresh Circulation. The manner how the Animal spirits are produced Dr. *Willis de ferm. c. 5.* sheweth by a Similitude. As in making highly rectified spirit of Wine with a glass Alembick, a Sponge being put into its Pipe, only the most subtile part can pass; so from the hot rarified blood, only the most Subtile spirit (as it were distilled) can pass through the Cortical substance of the Brain. This Liquor thus distilled doth obtain a higher degree of perfection, because the Brain abounding with a volatile Salt doth much exalt these distilled Spirits; so that they are as it were endowed with a Ferment, and by their volatile Salt penetrate like Spirit of Harts horn, more than Spirit of Wine.

Cartesius seems to refer it to the *Glandula Pinealis* separating the Spirits from the *Plexus Choroides*. But his Opinion being so wide from Truth, as may be soon made appear by a

scrutiny into the Nature of Glandules, I shall pass it by.

Riolanus would ascribe it to the ventricles of the Brain; but for a full confutation thereof I shall refer the Reader to *Dr. Wepfer, de Apoplexia*, only adding this Observation of my own.

I was called to a Youth about eight years old, whom I found much complaining of a Heaviness and Dulness of his Head, with a great inclination to sleep. His head I observed to exceed in bigness all the other parts in a double proportion. The Distemper I found to be a *Hydrocephalus*, and from the Symptoms might easily perceive it a fore-runner of death, that did soon ensue. I opened his Head, and before sufficient Testimony poured out of the ventricles of the brain near a full Pint and half of clear *Lympha* like Rock water: which would certainly have hindred any generation of Animal spirits there, and all Derivation into the Nerves from thence, especially seeing his Senses remained clear, and his head for a long time gradually increased. More probable then it is that the Animal spirits are elaborated in the Cortical or Ash-coloured part of the brain, by the saline ferment and percolation through the pores of the same. So that the Animal spirits only by their high exaltation and purification differ from the Vital spirits, which latter are the Matter of the former.

Spirits

Spirits thus elaborated are by others succeeding them impelled into the medullous part of the brain or *Corpus callosum*, where they have a large place to exercise the *Phanfy*; in the *Plica* of the Brain to lay up *Idea's* for the *Memory*; and in the *Corpora striata* to exercise the *Sensus communis*; and according as they are directed along the Nerves to perform Motion, or as they receive Impressions undulating backward to perform the External Senses.

Probable also is the Opinion of *Willis* and *Diemerbroeck*, That there is a *Succus Nervosus* or Nervous juice, serving as a spirituous ferment to separate the Nutritive parts from the Blood. As the Blood supplieth Matter, so the Nervous Juice is as an Active Form in Nutrition. And good Reason may be given for this Opinion; for in a *Palsie*, wherein the Nerves are obstructed, although the Parts are imbued with a constant supply of warm blood, yet the Parts will fade away for want of Nourishment assimilated to them, as a supply to that which was lost; because the *succus nervosus* is wanting, which precipitateth the Nutritive Matter from the rest of the blood.

Next to the three principal Ferments cometh in That of the Spleen. As for the opinion of *Dr. Glisson*, *lib. de Hep. cap. 45.* that the Spleen doth prepare an Alimentary juice that is imbibed by the Nerves, and by them carried

up to the Brain, and back again through the Nerves to the parts of the whole body, to me it seems irrational ; that the same juice should be carried to and fro through the same vessels, and that an Acid juice (for such is that of the Spleen) should be supposed to be a vehicle for the Animal Spirits that are a volatile *Alkali*. The proper Use then I imagine as thus.

The Spleen by its Ferment placed therein *ab origine*, doth with the Nervous juice deposited in the Glandules by the extremities of Nerves terminating in them, cause an Acidity in the blood brought by the Arteries. By which Acidity the *Bile* consisting much of retorrid lixivial Salt, is hastened towards a separation, even as by mixture with other *Alkalis* and *Acids* may be seen : so that the blood reduced from the Spleen by the *Ramus Splenicus* doth in the Liver soon make a Secretion of its Choler.

An Acid Ferment may well be supposed in the Spleen from its natural structure ; which is chiefly made up of membranous Cells like the holes of a Honey-comb, about which the ends of the blood-vessels are twisted like the Tendrils of a Vine. Now here the Glandules, as in other parts of the body, may be well supposed to contain an Acid juice, and may the sooner impress its ferment on the blood by its little stay in the cells, before it is carried away with the subsequent streams. For a large account

count hereof I shall refer the Reader to *Malpighius de Liene*.

The Seminal parts both in male and female seem to be highly endowed with a Ferment; insomuch that the *Sal*, *Sulphur*, and *Mercury*, are as it were exalted into a noble *Elixir*, from which the *Embryo* taketh its rise; I mean the *semen* in males and the *ova* in females, for both by the ferments of the Genital parts are elaborated out of blood. The manner how is too large for me here to describe, and may be seen in ample manner in *Harvey* and *de Graef*.

It is beyond my intention to take upon me here to dispute, whether or not Milk is made by a bare transcolation through the Mamillary Glandules, or by an innate Ferment of the Dugs; or how the *Bile* is separated in the Liver, or whether all the Glandules of our bodies are endowed with a Specifick ferment. But this we may lay down as a Truth, *viz.* That the *Archens* in the first formation hath bestowed on every Part a peculiar configuration of Pores, and a fermental Digestion to receive its proper Aliment, and convert it into a similar substance to repair that which was lost, and hath assigned a peculiar Office to every particular part.

PART

PART III. SEC. 2.

AS from the fermental *Digestions* in their full vigour and lustre the Organs have that which is requisite to their functions, and consequently Health is entire; so from their diminution and depravation Distempers take their Original. The Concoction of the Stomach and other fermental Digestions of the body may suffer by the inordinate Use of the *Sex Non-naturalia*; but I shall take a short survey of Diseases as they are immediately derived from the disordered Ferments.

The Stomachical Ferment may be vitiated, so as to leave a twofold Errour on the Aliment, *viz.* *Crudity* and *Over-acidity*, which concur to laying the foundation of many Distempers. In this sense I mean, *viz.* That All Diseases cannot be immediately derived from This, or the Other particular ferment, but that the Generality of Distempers owe their original to the Error of Fermental Digestions, the one many times concurring as a Procatartick, and another as a Proximate cause.

When the Stomachical ferment is debilitated, the Aliment receives an imperfect
Con-

Concoction; whence a *flatus* is excited and a Pain in the Stomach, with an inclination to vomiting and abhorrence of Dyet. If it pass thus crude through the *Pylorus* into the Intestines, it lays a foundation of a *Diarrhœa*, *Worms*, *Obstruction* of the *Misentergy*, &c.

An Error in the first Concoction cannot be corrected in the second; wherefore the crude Alimentary juice being conveyed through the Lacteal and Thoracical vessels, and so away to the Heart, doth cause a spurious and febrile conflict with the Principles of Sanguification; and according to the quantity of the depraved Aliment, that in 24 or 48 hours &c doth rise *ad turgescientiam*, and able to vie (as it were) with the blood, so it giveth the difference betwixt Quotidian, Tertian, or Quartan Agues, &c. as several modern Authors have observed. And as it is a cause of Intermittent, so also it layeth a foundation of Continual fevers, according as the Principles of the blood by this depraved Ferment become too much exalted. For if the Spirituous part be highly inflamed, then a *febris Synochus* or *Ephemera*; if the Sulphureous part be exalted, or a Putrefaction of Humors in the blood-vessels, then a Putrid fever; if a contagious *Miasma* be added, then a Malignant fever, such as the Plague, small Pox, Measles, But whether this vitiated Juice be made so by the vitiated *Bilis* and *Lympha*, as *Sylvius de*

leboe would have it, is not to my purpose to dispute.

If the vitiated *Succus Nutritivus* arrive to the Brain, and by Obstruction of the Pores hindereth the Third Digestion, *viz.* the elaborating of Animal Spirits, or stop their motion, or subvert the volatizing Ferment of the Brain, it causeth an *Apoplexie*, *Lethargy*, *Coma*, or *Carus*. And according as the Nerves are obstructed, and the Spirits with their vehicle the *succus Nervosus* defiled and stoped in their passage, thence a *Palsie* great or less. And as the vitiated juice hath passed the Cortical substance of the Brain, and is confused with the Animal spirits, so as to cause an irritation of the Nerves and explosion of the Animal spirits, it causeth *Epilepsies*, *Convulsions*, &c.

To these Distempers the depraved Ferment of the Spleen doth contribute; for when the bilious Particles are not evacuated, but by long fermentation become retorrid and gross, then the Melancholy adust terrestrious blood subverteth the refined Texture of the Animal spirits, and bringeth on them a mighty gloominess, whence *Melancholy Phancies*; and as it impresseth its *labes* on the Spirits and *Genus Nervosum*, so it concurreth to *Hypochondriacal Fits*, and many Nervous diseases.

Every part in the body receiving a *Succus Nutritivus* from the blood is deprived of its
due

due nourishment, when the fermental Digestions are deficient, and the Aliment unprepared: instead then of assimilating the *succus nutritivus* to each Part, it being a *succus depravatus* doth instead of assimilation cause *Apothumations, Tumors, Ulcers, &c.*

As the too much debilitated, so also the too great or over-acidity of the Stomachical ferment will be as a Ground-work for many Enormities. A proportionate Acidity (as I intimated before) is a cause of Digestion; so too great, and especially when alienated from its natural *Crafsis*, is a cause of Coagulation, Precipitation, and Fixation, and consequently of Indigestion. Besides the *Appetitus Caninus* caused by an exorbitant Acid gnawing the stomach; and the *Pica* and *Malacia* from a depraved Ferment, causing an inordinate appetite after objects unfit for Aliment, as *Chalk, Stones, &c.* a parallel instance may be given (of Precipitation, Coagulation, and Fixation of the Aliment by too great acidity of the Ferment,) I mean that of our Cooks *Pickling*, as of *Sampier, Cucumbers, &c.* whose Pores are filled with the points of the acid Particles fixing themselves in clammy matter, which put a stop to an ingress of fermentative Particles from the Air that may tend to the dissolution of the *Compages*, and so are as a coat of Defence from putrefaction. And as the aereous particles are not allowed free passage, so

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neither are the fermentative particles of the Stomachical Digestion admitted to enter, and raise a luctation with the active principles of the Aliment, whose parts are as it were linked together by the acid particles of the *Pickle*, that the Stomachical ferment cannot tear them in pieces, except when they are taken in a small proportionate quantity, and not able to out-vie That of the primary Digestion. A like Instance may be taken from salted and dried meats, as *Beef, Bacon, &c.* which we find of a hard Digestion, and unfit for a weak stomach, because its parts are tied together and pores obstructed by saline Particles, and not to be freed and set in motion without a Ferment stronger than the Coagulation.

And that the Depraved ferment by over-acidity in the primary Digestion is a cause of many disorders, yea whilst in the stomach affecting its Orifice causeth *Ructatio acida, Cardialgia, Ardor cum dolore, &c.* may be concluded from their cure by fixed *Alkalis*, as *Sylvius* doth observe, whose property is to correct and destroy an Acid; and therefore in these cases may rationally (besides Experience proves it) recommend *Coral, Crabs-eyes, Margarites, Chalybis limatura, &c.* *Sylv. de alim. ferm. in ventric. l. 1. c. 7. Prax. med. lib. 1. c. 7.*

This exorbitant Acid sent into the Intestines may with sharp vapours excited therefrom

from) cause an *Iliack Passion*, *Dysenteries*, *Cholick*, &c. But if it be conveyed to the Blood-vessels, so as to pass the stage of the *second Digestion*, it doth destroy the sweet *Balsamick Crasis* of the Blood; and by altering its genuine texture doth give occasion to some of its Principles to become too much exalted, and as the ingenious *Dr. Willis, de Fermentatione & Febris* hath proved, doth produce several Diseases; but its Effects may principally be discerned in *Putrid* and *Intermittent Fevers*: The *Phænomena* of which latter *Fran, de le Boe Sylvius de febr.* ingeniously solveth from a spurious acid *succus Pancreaticus* and depraved *Bilis* making sudden Eruptions into the Intestines, and a mutual Conflict with each other, yea when absorbed by the vessels into the blood.

Not only the debilitated (as I said before) but also the over-acid and vitiated Ferment may concur to the Production of many Distempers; for it precipitating the sweet and well-poised Temperament of the Blood, giveth Fluidity to its *Compages*, and from thence an Exaltation of its sulphureous and saline Parts. This *Dyscrasia sulphureo-salina* and *salino-sulphurea* impressed on the Blood and *Genus Nervosum* giveth Being to the *Scurvy*, which sheweth it self by its vitiated Ferment in various Dresses over the whole body, such as Weariness, Dulness of Spirits, Spots, Swellings, Asthma, Change of Urine, flying Pains,

stinking Breath, Rheumatisms, Gout, &c.

Among the Distempers derived from a Pravity in the *second Digestion* may be reckoned the *Dropsie*, and not as *Sennertus*, following the footsteps of ancient Physicians, laying it upon an ill Constitution of the Liver, would have it. For on all hands it being allowed to be from a Non-separation or an Abundance of Serous Humors retained in the body, want of a due Ferment (to the destroying of which an exorbitant Acidity will in no small measure concur) as well as an Obstruction in the Vessels or *viscera*, may much contribute thereto. For when the Saline and Sulphureous particles are deficient in their due state and proportion, either by want of Aliment, or by consuming Chronical Diseases, or by a depraved Stomachical Ferment communicating it self to the Alimentary juice received into the blood, or by want of a due access of Air, or by a mixture of heterogeneous things with the Aliment; then the blood becomes too much dilute and watery. As by Obstructions in the Urinary and other Passages, so the loss of a due Ferment (as many Cases might be produced of an *Ischuria* or Suppression of Urine by a meer defect of Fermentation in order to a Secretion) to lax the Contents in the Blood-vessels, or rather to make a Secretion, the Urinous *Latex* is not separated from the blood, but regurgitates in its Vessels, until Nature overburdened

burdened layeth it down in the Habit of the body. thence an *Anasarca* ; or in the *Abdomen*, and thence an *Ascites* ; and if with a *flatus* in the Cavity of the lower Region, thence a *Tympanites*.

Besides the Usual causes of a Consumption of the Lungs, such as an Ill-conformation of the Breast, an Hereditary weakness in the Lungs and Inclination, precedent Diseases as *Pleuritis*, *Empyema*, *Variola*, &c. obstruction of the Lympheducts of the Lungs, unwhosome Air, and acrious Steams, a spurious Acidity impressed on the Blood and the *Genius Nervosum* hath no small share; in as much as the Corroding humor will soon exulcerate the Lungs, or at least excite the *Diathefis morboſa* of them.

Beside the exorbitant Ferment of the Kidneys (if any there be) and their lax *Compages* too much percolating the *Serum* from the Blood, this inordinate Acidity causing a too loose Contexture of Parts, and consequently too great a Secretion of Serous humors, doth much concur to the foundation of a *Diabetes*. As an *Ischury* many times doth not so much depend on the Stone or Obstruction of the Urinary vessels, but on a too strict and fast *compages* of the blood, when for want of a Saline ferment the Serous parts remain unseparated ; so from too much Acidity, too great

a Secretion, and consequently a *Diabetes*.

This spurious Acidity assailing and combining with the Tartareous recrements of our bodies, doth coagulate into Gravel or Stones commonly in the Urinary passages. For all Stony Concretions take their Original either from a viscous Matter, or fabulous Earth congealed together by a *Saline Agent*, as *Nitre*, *Alum*, *Sal Gemma*, &c. or by a *Seminal petrifying Juice*, whence many stony Concretions take their growth, as *Coral*, *Coralline Moss*, and many other Marine Concretions. Yea perhaps it might be truly asserted, that *Rocks* take their growth from the Plastick power of a petrifying Seed.

If this depraved Acidity arrive with the Blood to the Brain, so as to cause Obstructions, (which are as Bars to stop a generation of fresh Animal Spirits) or to deprave its Ferment, it effecteth a *Coma*, *Lethargy*, *Carus* or *Apoplexie*, according as an acid, serous, or otherways vitiated humor hath entered the Brain more or less, and the Spirits retire from the outward parts of the Brain, or are incapacitated for Motion. But if a putrid recremental *sordes* hath entered with, and defiled them Animal spirits that are generated, it causeth an Explosion of the *Spirits* until they have shaken off the heterogeneous Matter offending, as in an *Epilepsie*, *Convulsions*, *Swoonings*, &c. If

If for a Nutritive juice to be conveyed to each part, that by its proper digestive Ferment assimilateth a convenient matter to repair that which was lost, a sower fretting Humor is advanced in its place ; instead of Nutrition many Diseases are occasioned. For the peculiar ferment of each part being hereby depraved, That matter which should be Nutritive, will become a sharp corrosive substance or humor, as in *Cancers, Fistulas, Ulcers, Aposthumations, Leprosies, Inflammations, Strumas, Scabies*, and many other maladies.

If the thus depraved Aliment reach the *Genus Nervosum*, but not so powerfully as to produce a multitude of Infirmities incident to that kind, yet sufficient to cause the *Succus nervosus* to degenerate from a volatile spirituous Ferment into an Acid humor, and by the extremities of the Nerves to be laid down in the *Synodia* of the joints and the extremities of the Organs, where the nervous fibres end, and it there meeteth with a Tartareous or fixed humor from the blood ; the Gout taketh its off-spring, or at least is excited from a latent hereditary Seed. From the combination of these different saline humors (even as from spirit of Vitriol and oyl of Tartar) cometh white hard Coagulums or Nodings ; and by the irritation of the nervous fibres a flux of Humors, and consequently *Solutio Continui* is the Result ; whence the Gout,
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attended with his various symptoms or wracking Torments, approacheth Champion-like almost irresistible. The *Gout* Enemy-like having one displayed his Colours, how easily are its forces increased by the eating of Salt-meats, drinking of Acid liquors, and *French* Wines much abounding with a Tartareous Salt: which maketh the aforesaid Cause very probable.

It may be objected, That if a spurious Acid or depraved Fermental juice of the *first Digestion* be thus transferred from the stomach through the subsequent Digestions, as to lay a foundation of so many Distempers; then from a depraved stomachical Ferment, the Diseases resulting from the second and third Principal, and other peculiar Digestions, will all arise together, because the same depraved Alimentary juice is carried in a very small time through them all.

Answ. An Error in the first Digestion being not corrected in the second or subsequent, thence it will follow; That an Error in the stomachical Ferment will be as a Proximate or at least as a Procatartick Cause of many Diseases immediately ensuing the Digestions subsequent to the first. Yet it may not be concluded, that it always concurreth as a necessary Cause. For many times Distempers are the very Products of, and are derived from the Depravation of latter Digestions, without

out any previous disposition from the primary Ferment; as the Depraved ferment of Sanguification or Production of Animal Spirits may be no less hurtful to our bodies, when it is immediately derived from the Errors of subsequent Digestions, than when it is laid in the stomachical or first Ferment.

Thus the Blood wanting a vital Ferment in the Heart and Arteries, or its usual volatifying Ferment from the Air, for want of a due Secretion of its recremental *sordes*, by Obstructions of the vessels, want of Perspiration, and inordinate use of the *Sex Non-naturalia*, &c. will cause *Fevers*, *Scurvies*, or other Distempers incident to the blood, when the stomachical Ferment may be entire.

The Brain also being too lax or weakened by the irregular use of the Six *Non-naturalia*, or by the illness of them, or otherways having lost its saline volatifying Ferment, may of it self give occasion to many Distempers incident to the *Genus Nervosum*.

The Womb in the Female sex by its peculiar Ferment causeth an inturgescence of the Uterine blood-vessels, so as to open them, and make a Lunar Evacuation of the superfluous blood; which by the intention of Nature is designed for the nourishment of the *fœtus*, but if there be no Conception (excepting impediments)

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diments) then a Menstrual flux. If the blood-vessels be obstructed by gross humors, or their orifices closed by Cold, &c. then the superfluous blood ready for Expulsion contracts a violent acrimony, and regurgitates with the circulating blood to the Heart and Brain, whence *Syncopes, Palpitations of the Heart, Faintings, Convulsions, Suffocation of the Lungs*, yea many other Distempers according as the Blood and the *Vital Spirits* are tainted, or the *Animal* defiled. Instances might be given of an *Epilepsie, Palsie, Tumors, Scurvy, &c.* occasioned by the stoppage of the Menstrual course, which seem to be from the enormities of the second and third Digestion; but the *febris alba* peculiar to this sex with its usual symptoms plainly illustrateth, that the Menstrual Obstruction may ill affect the second and third Digestion.

Not only in the Female, but also in the Male the Spermatick vessels, exorbitant or deficient in their Ferment, may produce direful disasters.

The Spleen by its ferment helpeth to sublimise and exalt the feculent and terrestrious parts of the blood brought by the Arteries, so that by the Splenical ferment the blood returneth in the veins far more pure with its exalted Principles, and fitter to deposite the the Bile in the Liver. But when the Spleen is ill-affected, the blood either over-fermenteth

eth, as in the Scorbutick and Hypochondriacal diseases; but if obstructed or Scirrous, the blood is deprived of its due ferment, and thence may occasion a *Dropsie, Cachexie, &c.*

To these may be added the depraved ferment of each Part, all-sufficient to produce Maladies in them, yea when the foregoing Digestions are in good plight. But I shall not insist thereon, having taken a short Abridgment of most of the Distempers incident unto our bodies, which may lead me to an Enquiry after the Vertue of this *Ilmington-Spaw.*

PART III. SEC. 3.

After a short Curfory of Diseases, I come next to enquire into the Medicinal Use of this *Ilmington-Spaw* ; and finding it to be a Chalybeat Spring, a little Scrutiny into the Nature and Artificial Preparations of *Mars* will much help to our business in hand.

Iron by a Chymical *Analysis* is found to consist of *Salt*, *Sulphur*, and *Earth*, as the three principal Constitutive Ingredients, with a small quantity of *Water* and a less of *Spirit*. I say not, that These are the first Principles, (for it like other Metals is derived from *Water* or a Nutritive *Succus* as a more remote, but Matter indeterminate as the real primary Element) but that They are such which do immediately make up the Body of Iron, and expose it as such an Object to our Senses.

Chalybs or *Steel* doth differ from *Iron* only by Calcination with *Horns*, *Claws*, and *Hoofs* of Animals, or with such like *alkalis* laid *stratum super stratum* : Which by their Alkalize volatile Salts do carry away in Calcination many of the soluble parts of Iron, and destroy

destroy much of its Acidity. So that *Steel* is of a more fast and hard body, or of a closer texture of Parts than *Iron*, and doth much partake of an Alkalizate Salt.

The vertue and operation of *Mars* doth chiefly depend on its Saline and Sulphureous parts, and according as they are more or less set at liberty from the terrestrious, so a Preparation is more or less Medicinal. The usual Compositions are these: 1. *Crocus Martis aperitivus cum sulphure, cum aqua, vel aceto.* 2. *Crocus Martis astringens.* 3. *Tinctura Martis.* 4. *Extractum Martis.* 5. *Mars diaphoreticus.* 6. *Vitriolum Martis.*

1. *Crocus Martis aperitivus cum sulphure* is made by applying a Butt of Brimstone to a hot Bar of Iron, or by calcining the Filings of Iron with Sulphur in an earthen pot or Crucible. In either way the Acids of Sulphur do penetrate the body of *Mars*, so as in the operation to carry off much of the sulphureous parts of Iron, but by the addition of the acid parts of Sulphur to much increase the Saline. Some of the Sulphureous do yet remain, is apparent by the fetid savour in Belchings after the taking of this *Crocus*. That the Saline part is increased, is clear; because the Weight of the Iron will be increased by the Preparation. For Sixteen ounces of good Iron, by weighing after the Operation is ended,

ended, will yield Eighteen or Nineteen (except the Calcination be vehement, which is needless) of *Crocus*.

This is an excellent Preparation, and worketh good effects upon a twofold account, viz. 1. because of its *Sulphur*, 2. its *Salt*. The *Sulphur* will enrich and add a new supply to a cold watery blood, so that in the *Febris alba*, *Pica*, and *Leucophlegmatia*, it will reduce the pale-faced Patient to a florid complexion; because of its *Salt* it is a good Depopillative, as in Uterine obstructions and those maladies peculiar to the Female sex, and in the *Dropsie* may be of good use because of its vitriolick Stipticity, that bindeth up the laxity of vessels and other parts.

In the making of *Crocus Martis cum aceto*, the Sulphureous parts are almost separated, insomuch that after it is swallowed down it yieldeth but a weak sulphureous savour. But by addition of the Acid parts of Vinegar, the Saline Principle of *Mars* is so much exalted and advanced so near an Acid; that by instillation of other Acids it will scarce make any effervescence or ebullition at all, yea weaker than *Crocus cum Sulphure*, that maketh a far less ebullition with *Acids* than plain filings of *Iron*.

This *Crocus* in the Preparation having lost much of its *Sulphur*, is unfit for use when the blood is too low, or depauperated in its Balsamick

famick Sulphur ; as in diseases proceeding from a waterish blood, or from phlegmatick Obstructions. But where the blood is retorrid or adust, this *Crocus cum Aceto* by its Saline Principle being cool and aperient is of good use, as in *Hypochondriacal* distempers, *Carbuncled* faces, and to astringe a laxed blood-vessel, because of the saline stiptick Principle implexed in the Terrestrious.

Crocus Martis cum Aqua is made by exposing *Plates* or *Filings* of Iron to the *Rain* or *Dew*, until it hath contracted a Rust, which collected is called *Crocus Martis cum Aqua*, or *ferri Rubigo*. This *Crocus* consisteth of the sulphureous, saline, and terrestrious parts combined together ; yea indeed it is the very substance of Iron, having its pores much opened by the Dissolvent or Saline parts of *Water* ; which not only maketh its Pores more open, but by combining with it maketh this *Crocus* an excellent Aperient medicine, whose Deop-pilative vertue chiefly dependeth on this Salt.

The Sulphur of Iron being retained in this Preparation renders it a fit ferment for blood, whose active Principles are weak and faint : And the Saline part (being exalted by That of the Dissolvent *Water* that much laxeth the body of *Mars*) renders it a good Aperient in Obstructions, as of the Liver, Spleen, Mesentery, Lacteal vessel, or Womb with its coherent parts.

Crude